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TM 11-2586

WAR DEPARTMENT TECHNICAL MANUAL

PUBLIC ADDRESS SET AN/TIQ-2

WAR DEPARTMENT • APRIL 1947

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TM 11–2586, Public Address Set AN/TIQ–2, is published for the information and guidance of all concerned.

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For explanation of distribution formula, see FM 21–6.

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DESTRUCTION NOTICE

WHY—To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW—1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut—Use axes, handaxes, machetes.

3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives—Use firearms, grenades, TNT.

5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT

WHAT—1. Smash—Cases, panels, controls, loudspeakers, connectors, handset, tubes, switches, terminal boards, tripods, and every other electrical or mechanical part, moving or fixed.

2. Cut—All wiring and cables.

3. Burn—All equipment cases and covers, cords, diagrams, and Technical Manuals.

4. Bend—All panels, cases, controls, and metal parts.

5. Bury or scatter—All the remaining pieces after destruction.

DESTROY EVERYTHING

Figure 1. Public Address Set AN/TIQ–2.

PART ONE
INTRODUCTION

Section 1. DESCRIPTION

1. General

Public Address Set AN/TIQ–2 is a six-tube, portable, electrical sound amplification system designed to serve large audiences.

2. Technical Characteristics

a. AMPLIFIER AM–20/TIQ–2.

Input voltage ..... 115 or 230 volts (v) at 60 cycles.

Power required ..... 150 watts (w).

Power output ..... 20 w at less than 5 percent distortion (depending upon position of tone control).

Frequency range ..... From 50 to 10,000 cycles with maximum variation of 3 decibels (db) (depending upon position of tone control).

Input channels ..... 8 as follows: two high impedance microphone input circuits, two low impedance microphone input circuits, carbon microphone input (100 ohms), radio input (high impedance), line (100 ohms), phono input circuit (100 ohms).

Number of tubes ..... 6 (3 of which are dual triodes).

Type of tubes ..... First three stages are JAN–6SL7/GT (third stage is used as inverter), output stage is JAN–6L6/GA two of which are used as beam power amplifiers, rectifier tube is JAN–5U4/G a full-wave rectifier.

Output circuit ..... Vari-tapped output transformer with 250-, 125-, 60-, 30-, and 6-ohm taps for speaker matching.

Auxiliary power ..... Amplifier may be powered from 6- to 12-volt direct-current (d-c) supply through use of Vibrator Power Pack PP–31( )/TIQ–2 (par. 43).

Booster circuit ..... Output circuit tapped at 100 ohms providing input voltage for additional amplifier when greater audience coverage is desired.

b. TURNTABLE MX–39/TIQ–2.

Input voltage ..... 115 or 230 v at 60 cycles.

Power required ..... Approximately 100 w (with heater in operation).

Heat control ..... 75-w heating unit controlled by thermostatic switch which closes heater circuit to power source at 30°F, and opens same circuit at 40°F.

Phono motor:

Type ..... Single-phase, shaded-pole, induction.

Speeds ..... 33⅓ and 78 revolutions per minute (rpm).

Speed control ..... Governor operated by accessible lever; controls desired speed plus or minus 10 percent.

Power required ..... Approximately 25 w.

Mechanical feature .. Interchangeable gears selected by movement of speed lever.

Reproducer head ..... Magnetic type using a permanent magnet, 100 ohms impedance, removable needle.

c. MICROPHONE M–2/U.

Type ..... Dynamic, moving-coil type, unidirectional.

Frequency range ..... 60 to 7,500 cycles.

Output ..... —56 db (relative to 1 volt-per-dyne-per-square centimeter sound pressure).

Swivel joint ..... Permits full 180° travel of microphone (horizontal to vertical to horizontal).

d. SPEAKER LS–103/TIQ–2.

Type ..... Reflex type for outdoor use; diaphragm attached to 15-ohm impedance voice coil suspended in permanent-magnet field.

Impedance ..... Vari-tapped transformer permits selections of 250-, 500-, 1,000-, and 2,500-ohm windings on transformer primary.

Power rating ..... 20 w (normal).
25 w (peak).

3. List of Components

a. COMPONENTS.

Component	Required No.	Height (in.)	Depth (in.)	Length	Weight (lb.)
Case CY–38/TIQ–2 (Amplifier AM–20/TIQ–2)	1	10	16	21 in.	75.0
Case CY–38/TIQ–2 (Turntable MX–39/TIQ–2)	1	10	16	21 in.	47.0
Case CY–37/TIQ–2 (Loudspeaker LS–103/TIQ–2)	1	23	22	33¾ in.	151.0
Case CY–38/TIQ–2 (spare parts)	1	10	16	21 in.	36.0
Loudspeaker LS–103/TIQ–2	2		19 diam	25 in.	22.0 ea.
Loudspeaker Stand MT–128/TIQ–2	2	48 (When collapsed)			18.5 ea.
Microphone M–2/U	2				0.875 ea.
Microphone stand	2				4.0 ea.
Headset HS–30–U	1				0.8
Reel RL–3 (each containing 100 feet of Wire W–110–B)	2				3.6 ea.
Cord CX–49/TIQ–2	2			10 ft.	1.125 ea.
Cord CX–50/TIQ–2	1			25 ft.	1.0
Cord CX–51/TIQ–2	1			10 ft.	0.375
Cord CX–53/TIQ–2	1			25 ft.	4.375
Cord CX–54/TIQ–2	1			25 ft.	2.375
Cord CX–55/TIQ–2	1			3 ft.	0.625
Cord CX–56/TIQ–2	1			25 ft.	0.875

Note. This list is for general information only. See appropriate publication for information pertaining to requisition of spare parts.

Figure 2. Contents of spare parts case (Case CY–38/TIQ–2).

b. RUNNING SPARES (FIG. 2). The following running spares are contained in case CY–38/TIQ–2 (marked SPARE PARTS):

Quantity	Part
10 ea	Fuse F1
10 ea	Fuse F101
2 ea	Lamp E3
4 ea	Needle, reproducer 0101
1 ea	Tube JAN–6SL7/GT (V1, V2, or V3)
1 ea	Tube JAN–6L6/GA (V4 or V5)
1 ea	Tube JAN–5U4/G (V6)

c. ACCESSORIES (FIG. 2).

Quantity	Part
2 ea	Record albums for 10-inch records (12 pockets)
1 ea	Record albums for 12-inch records (12 pockets)

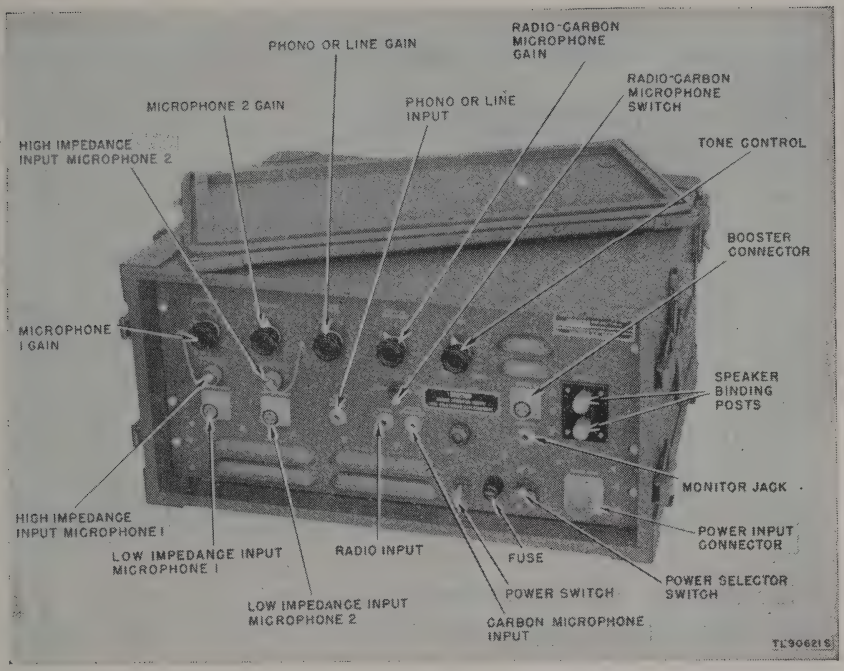

Figure 3. Amplifier AM–20/TIQ–2, front view.

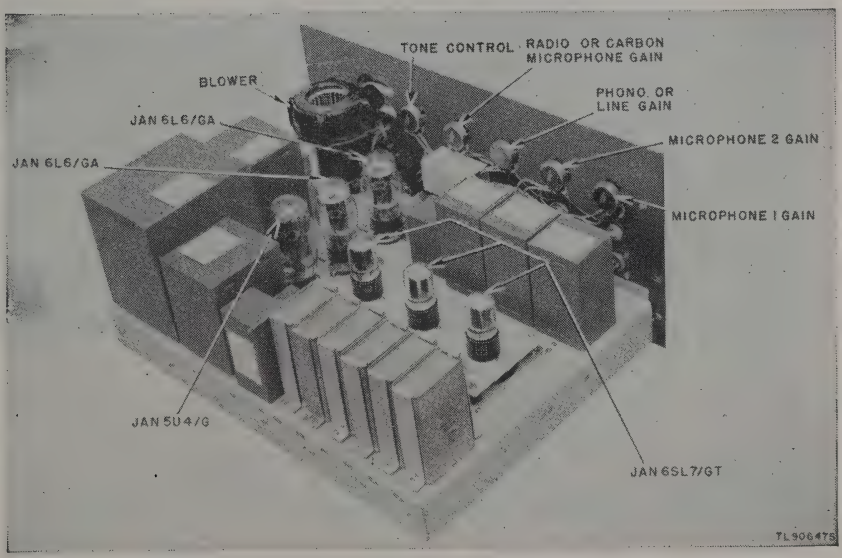

Figure 4. Amplifier AM–20/TIQ–2, top view of chassis.

d. WEIGHT AND DIMENSIONS OF EXPORT PACKAGES. The total weight and volume of the three packages comprising the export-packed equipment of Public Address Set AN/TIQ–2 are 576 pounds and 31.04 cubic feet, respectively. A break-down of the export packages follows:

Package No.	Contents	Dimensions (in.)			Weight (lb.)	Volume (cu. ft.)
		Height	Width	Length		
1	Loudspeaker Case CY–37/TIQ–2	26	25	36	245	13.55
2	Turntable Case CY–38/TIQ–2	26	20	36	241	10.83
	Amplifier Case CY–38/TIQ–2					
	Spare Parts Case CY–38/TIQ–2					
3	Loudspeaker Stands MT–128–TIQ–2	12	20	48	90	6.66

4. Description of Components

a. AMPLIFIER AM–20/TIQ–2 (FIGS.3, 4, and 5). The amplifier is completely inclosed in case CY–38/TIQ–2, which is constructed of plywood and is heavily reinforced with a steel frame and corners. The front cover of the case is secured with catch fasteners and may be removed to expose the amplifier panel. A neoprene gasket is fastened to the removable cover to protect the unit against entry of moisture. Carrying handles are provided at each end of the case. Catch fasteners are attached to the sides of the case to permit cases to be fastened together for use, storage, and transportation. All controls, switches, and power input and output connections are mounted on the front panel. All vacuum tubes necessary for the operation of the amplifier are shipped mounted in their respective sockets. The circuit label is mounted on the inside of the bottom plate of the amplifier chassis.

b. TURNTABLE MX–39/TIQ–2 (FIGS. 6, 7, and 8). All controls and the power-input connector are mounted on the panel of the turntable unit. A phono jack on the right side of the panel provides access to the reproducer-output voltage and receives the plug from the amplifier phono-input circuit.

(1) Two speed-control levers protrude from under the turntable. The left-hand lever actuates the gear mechanism in the gearbox of the phono motor and is used to select 33½ or 78 rpm turntable speed. The right-hand lever is used to adjust the governor position on the phono-motor shaft and serves to increase or decrease the selected speed within a plus or minus 10 percent range.

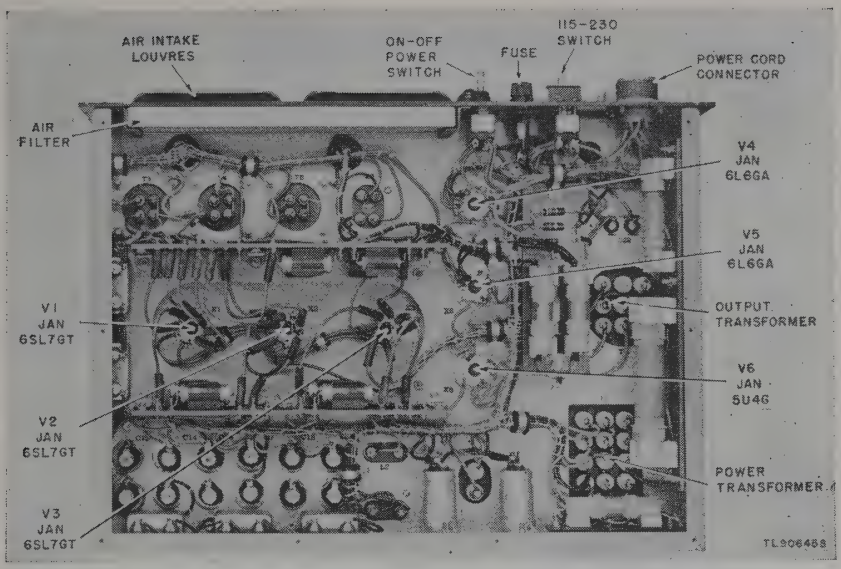

Figure 5. Amplifier AM–20/TIQ–2, bottom view of chassis.

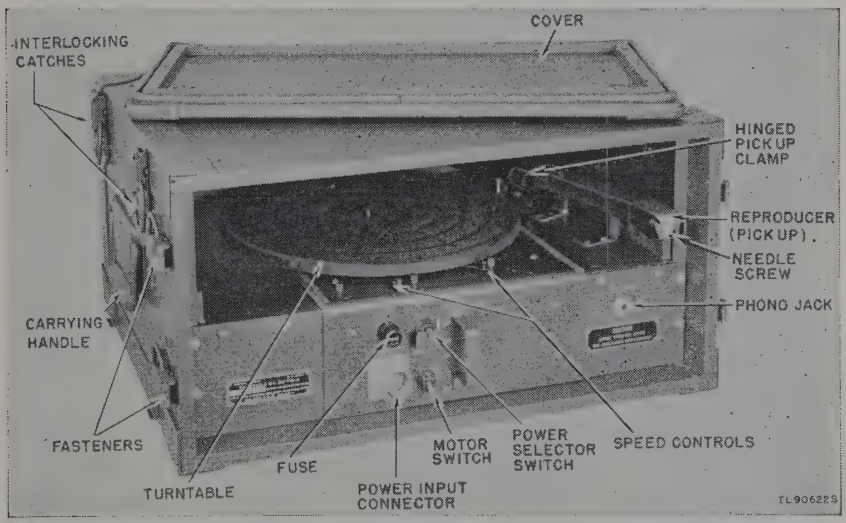

Figure 6. Turntable MX–39/TIQ–2, front view.

(2) The reproducer (pick-up) is mounted on the right side of the turntable shelf. The pick-up arm is mounted in the rear of the compartment with six screws. It is designed to travel in an arc that will accommodate 10-, 12-, and 16-inch records.

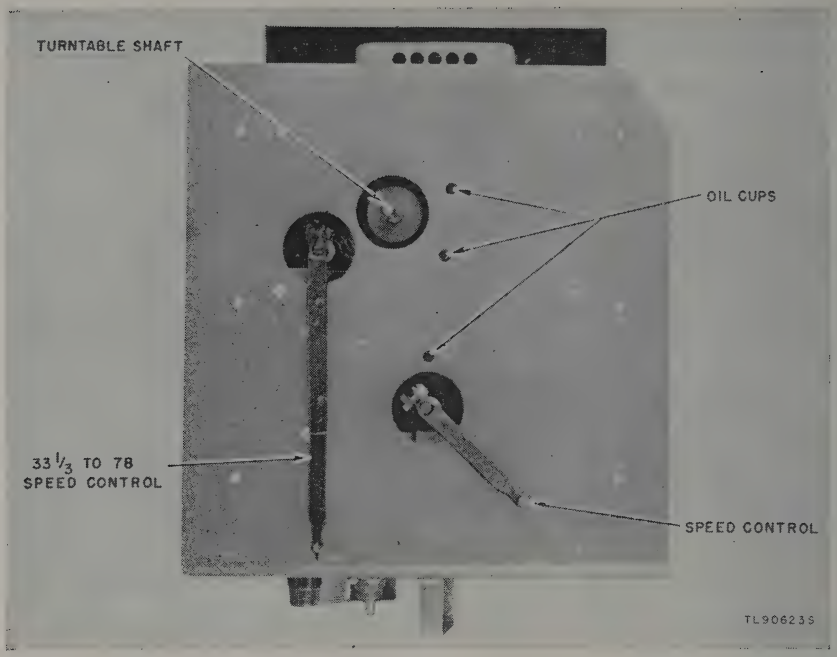

Figure 7. Turntable MX–39/TIQ–2, top view of chassis.

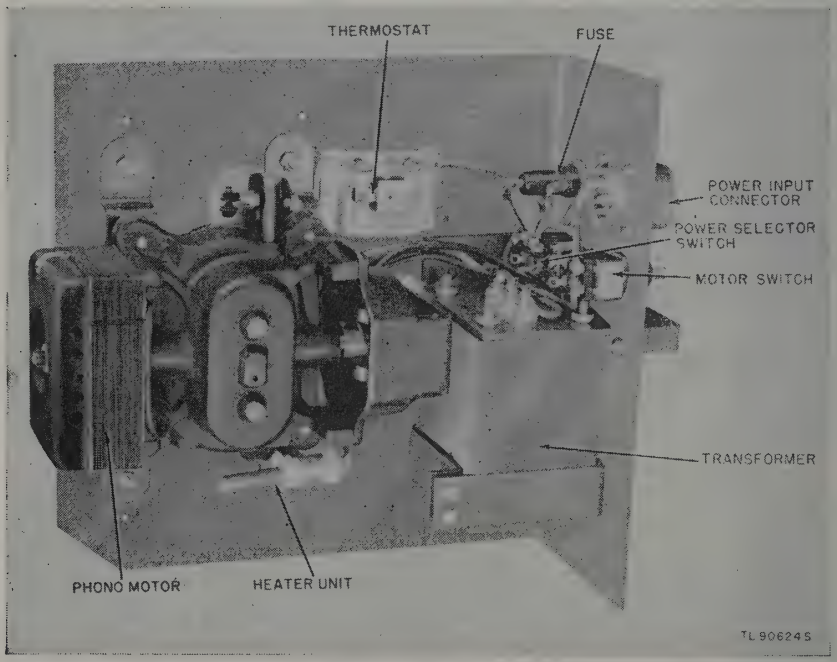

Figure 8. Turntable MX–39/TIQ–2, bottom view of chassis.

(3) A special hinged clamp, located midway on the pick-up arm, serves to hold the pick-up arm securely during transportation. Another clamp located just behind the reproducer is used to support the reproducer between record changes.

(4) A thermostatically controlled heating element is located alongside the grease-packed phono motor and is designed to maintain motor operating temperatures at very cold ambient temperatures.

(5) The entire turntable unit is mounted on a slide assembly. To operate, the assembly is pulled out of the case until it is stopped by side projections. Case CY–38/TIQ–2, marked TURNTABLE, houses the complete assembly.

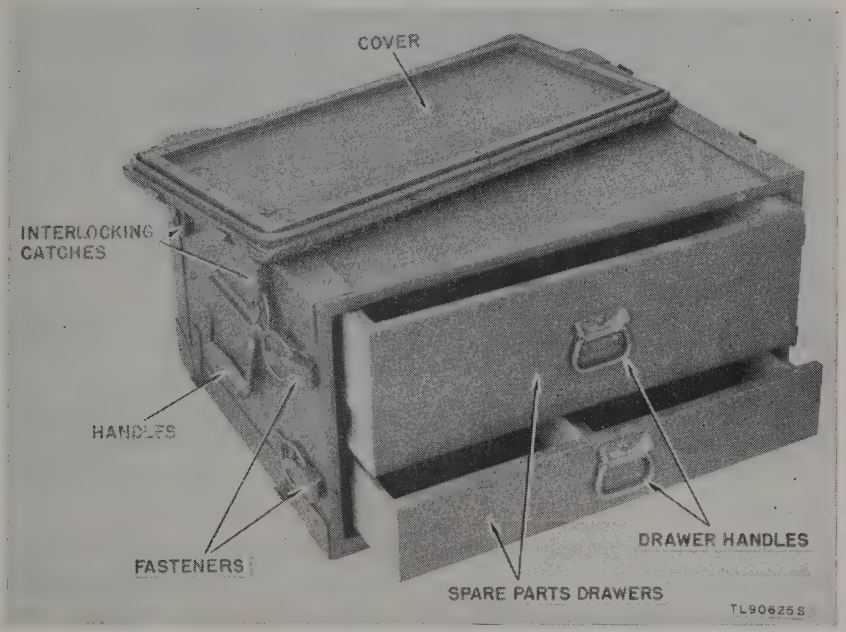

Figure 9. Case CY–38/TIQ–2 (spare parts case).

c. Spare Parts Case (Case CY–37/TIQ–2) (Fig. 9). The spare parts case is identical in general design and appearance with the cases housing the amplifier and turntable units. Two drawers are used to store spare parts, accessories, and the two microphones. The case is marked SPARE PARTS.

d. Loudspeaker Case CY–37/TIQ–2 (Fig. 10). This case is constructed of plywood, heavily reinforced with a steel frame and corners, and has folding type handles. The hinged lid is secured by catch fasteners. A stay chain on each side of the lid protects the hinges from strain. A compartment located on the lid is used

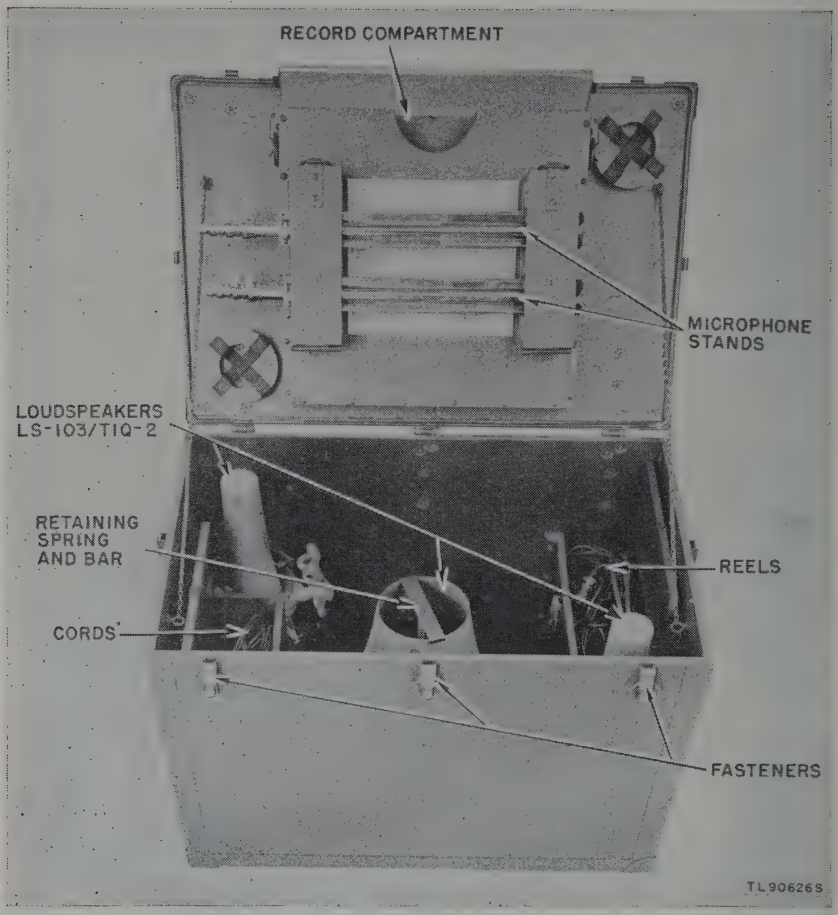

Figure 10. Case CY–37/TIQ–2 (loudspeaker case).

to carry 16-inch transcriptions. Provision is also made for carrying the two microphone stands. The case contains two compartments: one houses the driver units of the two loudspeakers, the other contains the horns of the two loudspeakers. These horns are nested one within the other. A spring, attached to the bottom of the case, is equipped with a crossbar which holds down the horns. Two wooden rings on the inside of the lid hold the driver units in place during transportation. Two other covered compartments house the necessary cables for the public address set. A neoprene gasket, fastened around the inside of the lid, protects the equipment from the entrance of moisture.

e. Cord CX–49/TIQ–2 (A-C Power Cords W201 and W202 (Fig. 11).

(1) Cord CX–49/TIQ–2 (W201) consists of a 10-foot rubber-covered, two-conductor cable, terminated at one end by a female

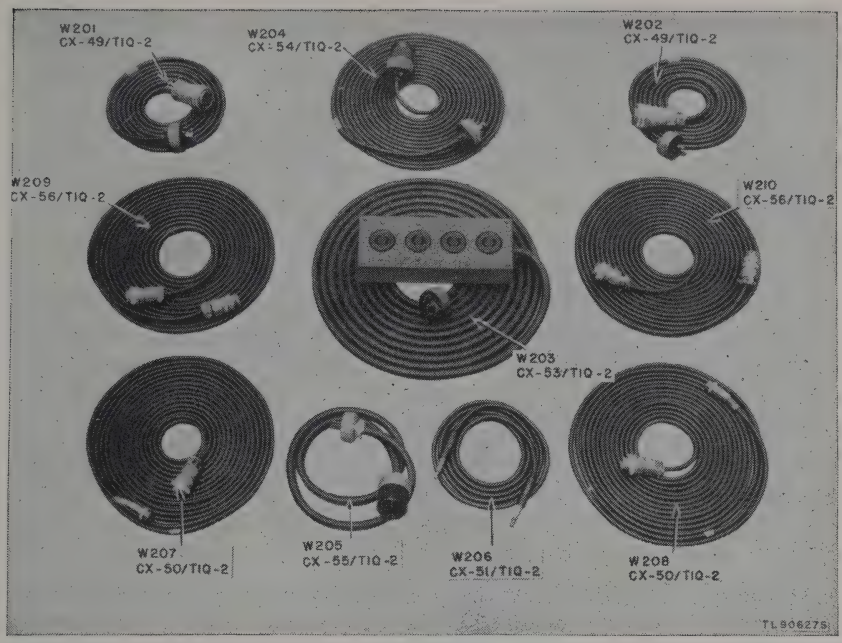

Figure 11. Cords and cables.

connector (J201). The other end of this cable is terminated by a male connector (P201).

(2) Cord CX–49/TIQ–2 (W202) is identical to the above cord (W201). Connectors P202 and J202 terminate cable W202.

(3) Cables W201 and W202 are used to connect the amplifier and turntable units to the junction box.

f. Cord CX–53/TIQ–2 (Power Extension W203 (Fig. 11). This cord consists of a 25-foot, rubber-covered, two-conductor cable, terminated at one end by a junction box containing four receptacles: J203, J204, J205, and J206. It connects power connection adapter Cord CX–55/TIQ–2 to the junction box, and provides the connection between the source of power and the four receptacles mounted on the junction box. The other end of Cord CX–53/TIQ–2 is terminated by a male connector (P203).

g. Cord CX–54/TIQ–2 (Power Extension W204 (Fig. 11)). This cord consists of a 25-foot, rubber-covered, two-conductor cable, terminated at one end by a female connector (J207). It is used between Cords CX–55/TIQ–2 and CX–53/TIQ–2, and functions as an added line to enable reaching a distant power receptacle. The other end of Cord CX–54/TIQ–2 is terminated in a male twist-lock connector (P204).

h. Cord CX–55/TIQ–2 (Power Connection Adapter W205 (Fig. 11)). This cord is a 3-foot, rubber-covered, two-conductor cable, terminated at one end by a female connector (J208). The other end is terminated by a male connector (P205). It is used to facilitate the connecting of a twist-lock plug which terminates Cord CX–54/TIQ–2 (W204) to the standard power receptacle which will accept only a parallel-blade connector. The male connector (P205) is a standard two-prong, parallel-blade, a-c plug commonly used on electrical appliance cords.

i. Cord CX–51/TIQ–2 (Turntable Pick-up Cord W206 (Fig. 11)). This cord consists of a 10-foot, rubber-covered, single-conductor shielded cable, terminated at one end by Plug PL–55 (P206). The other end is terminated by another Plug PL–55 (P207). It is used to connect the output of the turntable reproducer pick-up head to the PHONO OR LINE input jack on the amplifier panel.

j. Cord CX–50/TIQ–2 (Microphone W207 and W208 (Fig. 11)).

(1) Cord W207 consists of a 25-foot, rubber-covered, single-conductor shielded cable, terminated at one end by a female connector (J209). It is terminated at the other end by a male connector (P208).

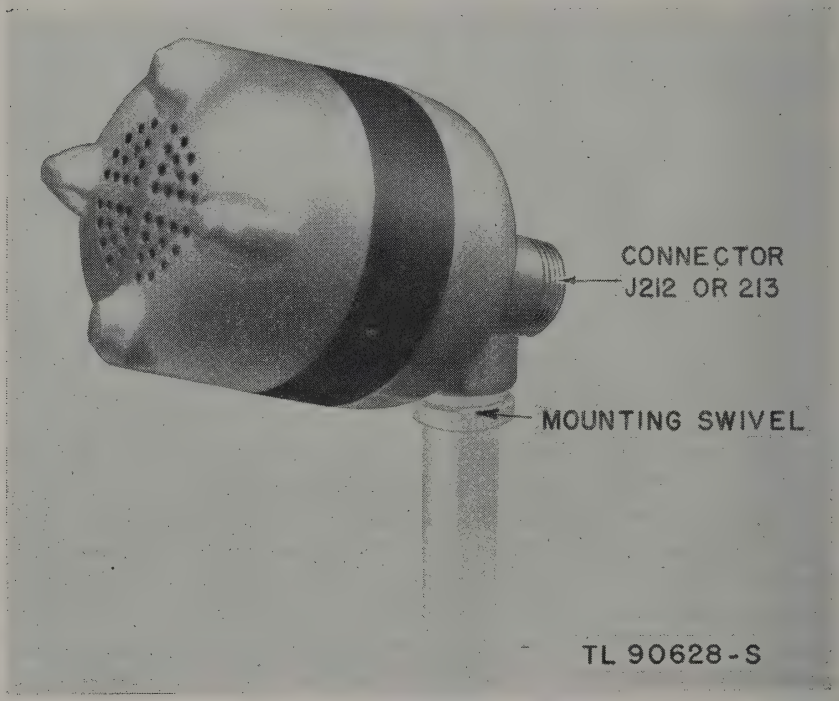

Figure 12. Microphone M–2/U.

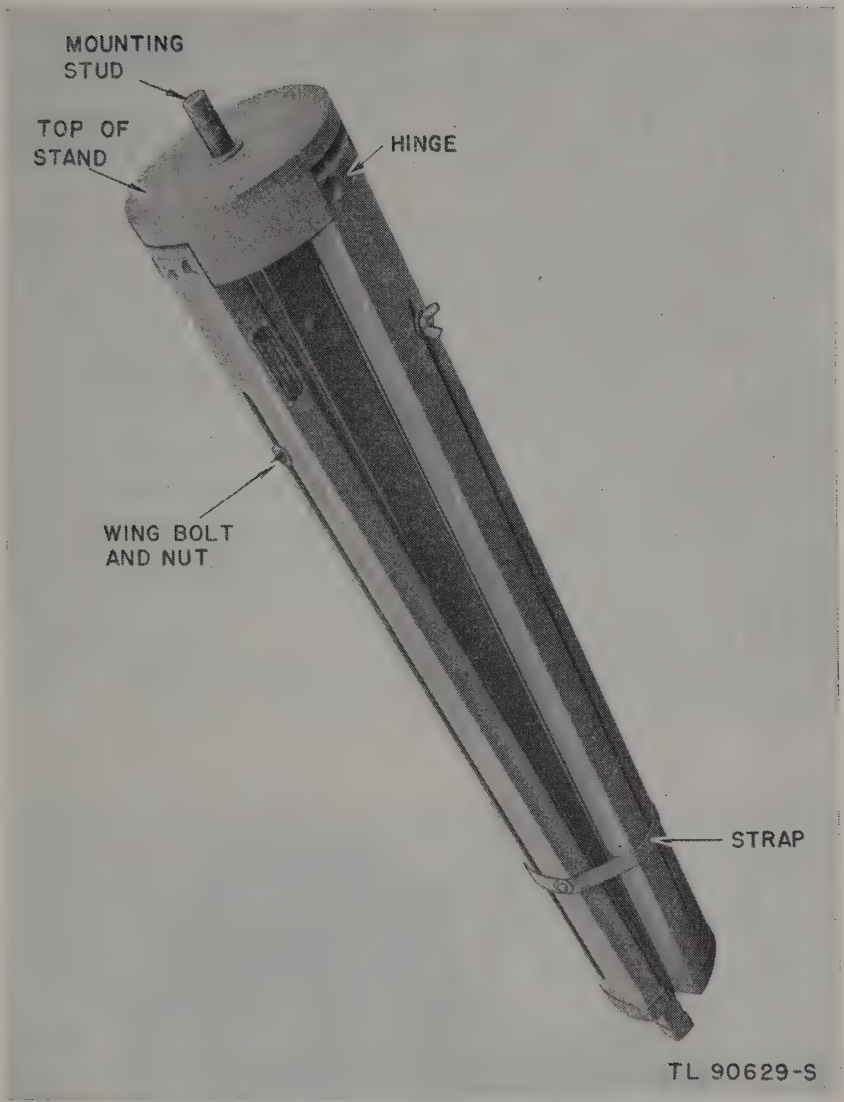

Figure 13. Loudspeaker Stand MT–128/TIQ–2.

(2) Cord W208 is identical to cord W207. One end is terminated by a female connector (J210) and the other end by a male connector (P209).

(3) The two cords are used to connect the two Microphones M–2/U to the input circuit of the amplifier through the two low impedance connectors on the amplifier panel (LOW–IMP–MIC–1 and 2).

k. Cord CX–56/TIQ–2 (Microphone Extension W209 and W210 (Fig. 11)).

(1) Cord W209 is a 25-foot, rubber-covered, single-conductor shielded cable, terminated on one end by a female connector (J211). The other end is terminated by a male connector (P210).

(2) Cord W210 is identical to cord W209. One end is terminated by a female connector (J212) and the other end by a male plug (P211).

(3) These cords permit a 24-foot extension of the microphone cords. They are connected between the microphone cords (CX–50/TIQ–2) and the amplifier-panel input connectors P1 and P2.

l. MICROPHONE M–2/U (FIG. 12). This aluminum-finished microphone is of the dynamic, moving-coil type. There is a friction lock at the swivel. Plugs 212 and 213 respectively, are mounted on the microphone cases.

m. LOUDSPEAKER STAND MT–128/TIQ–2 (FIG. 13). Loudspeaker Stand MT–128/TIQ–2 is made of wood which is painted olive drab. It consists of a round, flat top and three extensible legs, each fastened to the top with a hinge. It is adjustable when open from a height of 3 feet, 7 inches to a height of 6 feet, 1 inch. The legs may be individually adjusted to compensate for uneven ground and are locked in place by means of wingnuts and bolts. The mounting-bracket socket of the loudspeaker is placed on the mounting stud and locked with a wingbolt.

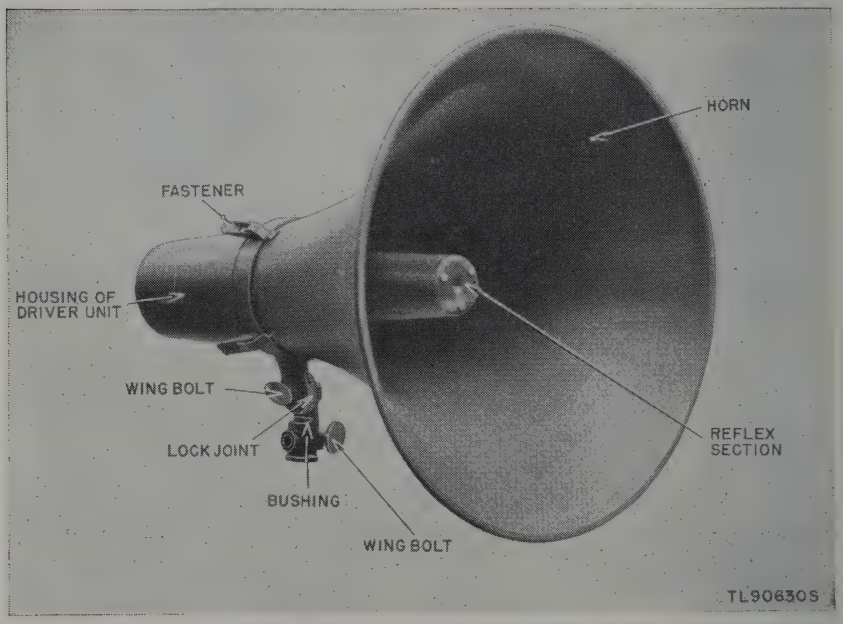

Figure 14. Loudspeaker LS–103/TIQ–2.

n. LOUDSPEAKER LS–103/TIQ–2 (FIG. 14). (1) *Speaker horn.* The speaker horn is a bell-shaped, sheet-steel assembly. Four slots in the neck of the horn are provided to receive the four fasteners on the driver unit.

(2) *Speaker driver unit.* The speaker driver unit consists of four major parts: permanent magnet, a diaphragm-voice-coil combination, a housing which serves as a reflector and a dust cover (to protect the delicate mechanism from the entrance of dirt and metal filings), and a line-matching transformer. The diaphragm is attached to the housing with three screws which maintain the voice-coil-centering adjustment. Four fasteners are provided for fastening the speaker horn to the driver unit. A bushing with a locking thumbscrew is secured to the bottom of the driver unit for mounting the speaker unit on Loudspeaker Stand MT–128/TIQ–2. The speaker driver unit is blastproof.

(3) *Mounting bracket and bushing.* The bracket is equipped with an adjustable ratchet (to permit elevation of the speaker) and with a bushing to fit the mounting stud on Loudspeaker Stand MT–128/TIQ–2. A wingbolt on the bushing is used to lock the bushing on the mounting stud. A wingbolt on a lock point is used to lock the speaker at the desired elevation.

Note. The wingbolts are peened over to prevent loss.

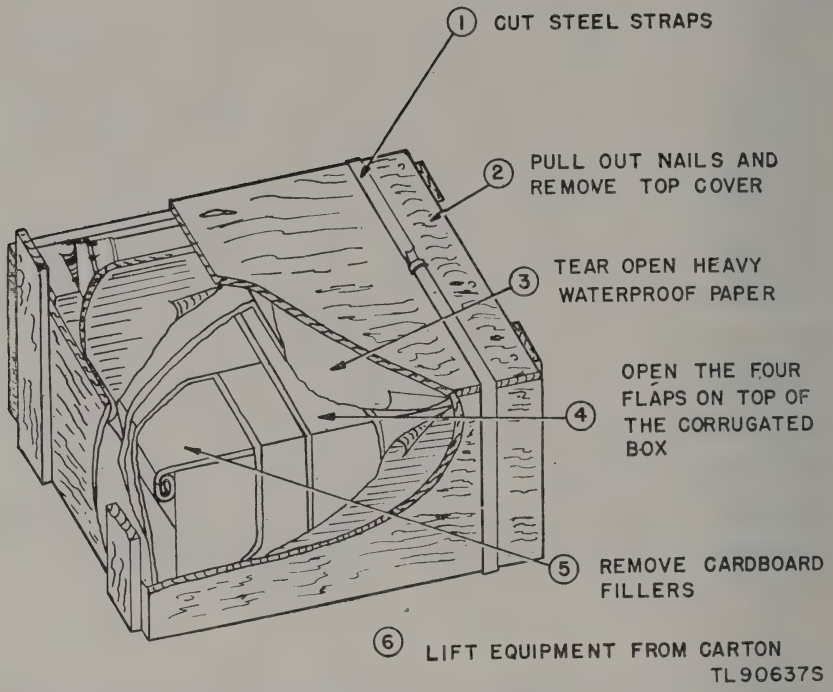

Figure 15. Cutaway view of export package.

5. Unpacking, Uncrating, and Checking

Unpack the equipment (fig. 15) as follows:

a. Place the packing case in a convenient location where it can be easily opened.

b. Cut the steel straps ①.

c. Remove the nails with a nail puller, and remove the top cover ②.

d. Remove the waterproofing paper wrapping ③.

e. Open the four flaps on top of the cardboard box ④.

f. Remove the cardboard fillers ⑤.

g. Lift the equipment from the box ⑥.

h. Thoroughly inspect the set for possible damage caused during shipment.

i. Check the contents against the list of components. (See par. 3.)

j. Remove the amplifier from its case and press the vacuum tubes securely in their sockets.

k. Inspect the cables for kinks and cracks.

l. Open the other packing cases as described above.

Caution: This equipment has been weatherproofed. *Do not damage* this protective coating.

6. Installation

a. Remove contents from Case CY–37/TIQ–2. Place items on clean surface. Close case cover and secure with fasteners.

b. Remove the front cover from Case CY–38/TIQ–2 (marked SPARE PARTS) by loosening the four catch fasteners. Set the spare-parts case on top of Case CY–37/TIQ–2.

Note. Case CY–38/TIQ–2 (marked SPARE PARTS) should always be used as the bottom case as shown in figure 1.

c. Remove the front cover from Case CY–38/TIQ–2 (marked AMPLIFIER) by loosening the four catch fasteners. Set this case on top of the spare parts case and fasten the two together with the two catches located on each side of the case.

d. Remove the front cover from Case CY–38/TIQ–2 (marked TURNTABLE) by loosening the four catch fasteners. Set this case on top of the amplifier case and fasten the two together with the two catches located on each side of the case.

e. To assemble loudspeaker LS–103/TIQ–2, insert the rim of the small end of the speaker horn into the throat of the speaker-driver unit. Place the catches of the four fasteners opposite the slots in the speaker-horn rim. Insert all four catches before pressing down the fasteners. Loosen the wingbolts securing the lock joint on the frame of the speaker, and place the bushing at a right angle to the speaker body. Then tighten the wingbolt.

Caution: The powerful magnet contained in the speaker-driver units will magnetize the steel parts of watches, compasses, and instruments thus making them useless. Remove such items from the vicinity of speaker-driver units.

f. Remove loudspeaker stands MT–128/TIQ–2 from their packing containers and unbuckle the retaining straps from the legs of the stand.

g. Adjust the legs of loudspeaker stand MT–128/TIQ–2 by loosening the wingnut and bolt on each leg and positioning the stand to the desired elevation. Then level the mounting and tighten all wingnuts.

h. Place loudspeaker LS–103/TIQ–2 on loudspeaker stand MT–128/TIQ–2 so that the bushing slides onto the mounting stud as far as it will go. Turn the speaker in the desired direction, then tighten the wingbolt securely on the bushing. Loosen the wingbolt on the speaker frame and adjust the speaker to the desired elevation. Tighten the wingbolt.

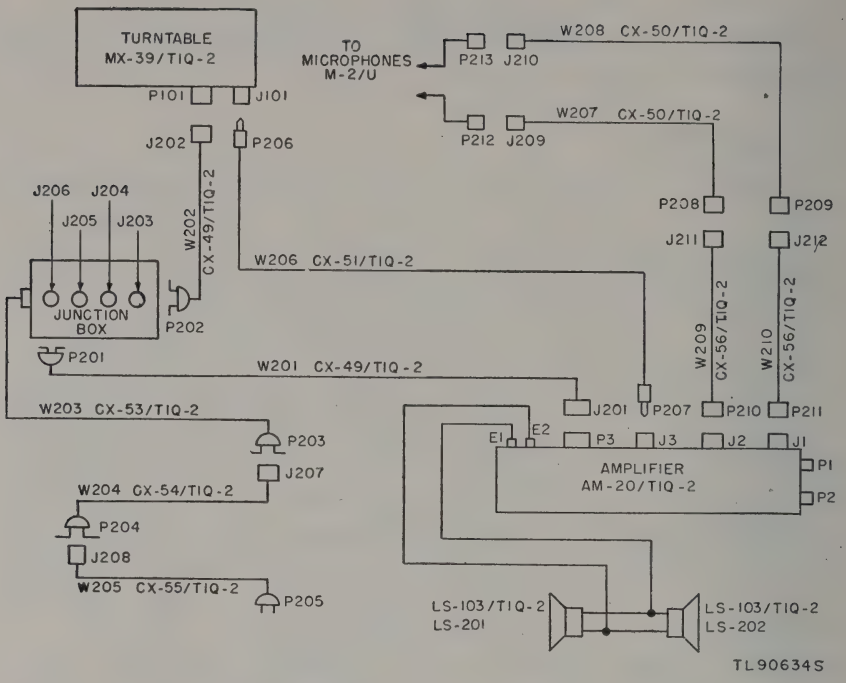

Figure 16. Interconnecting diagram.

7. Interconnecting Components (Fig. 16)

a. The back plate of the loudspeaker LS–103/TIQ–2 housing unit serves as a terminal board (E201). (See fig. 12.) If one loudspeaker is to be used, attach one wire of a speaker cable (field wire W–110–B on reel RL–3) to the binding post marked 0, and the other wire to the terminal marked 250. If two speakers are to be used, attach one wire of the cable to the binding post marked 0 and the other wire to the terminal marked 500.

b. Repeat the procedure described above for the other loudspeaker.

c. Attach two conductors at the other end of the loudspeaker cable to the SPEAKER binding posts on the amplifier panel; one lead to each of the two posts.

Note. If two speakers are used, two wires will be inserted in each SPEAKER binding post. If any loss of signal is noted when the two speakers are attached, reverse the wires from *one* speaker, at the SPEAKER binding posts.

d. Insert Headset HS–30–U plug into the MONITOR jack on the amplifier panel (if monitoring of amplifier output is desired).

e. Attach the microphone to the microphone stand.

f. Attach jack J210 of microphone cable W208 to plug P213 on Microphone M–2/U.

g. Attach connector P209 on the other end of microphone cable W208 to jack J1 on the amplifier panel.

h. Attach jack J209 of microphone cable W207 to plug P212 mounted on the other Microphone M–2/U.

i. Attach plug P208 on the other end to jack J2 on the amplifier panel. (See fig. 27.)

Note. If an extension of microphone cable W208 is desired, insert plug P209 into jack J212 of extension cable W210. Insert terminal P211 into J1 on the amplifier panel. Extension cable W209 may be used to extend the other microphone cable (W207) by attaching J211 to P208 and P210 to J2 on the amplifier panel.

j. Insert P207 of turntable pick-up cord W206 into J3 on the amplifier panel. Insert the other terminal of cord W206 (plug P206) into jack J101 on the turntable panel. (See fig. 30.)

k. Attach jack J202 of power cable W202 to plug P101 on the turntable panel. Insert the other terminal of cord W202, which is a twist-lock plug (P202), into either jack J203, J204, J205, or J206 in the junction box.

l. Attach jack J201 of power cable W201 to plug P3 on the amplifier panel. Insert the other terminal of cable W201 (twist-lock plug P201) into either jack J203, J204, J205, or J206 of the junction box.

m. Insert twist-lock plug P203 of W203 into jack J208 of cord W205. The other end of cord W203 is connected to the junction box containing jacks J203, J204, J205, and J206.

n. Plug P205 of cord W205 into any 115-volt or 230-volt, 60-cycle receptacle.

Note. If an extension for the a-c power cable is desired, attach jack J207 of the power extension cable to plug P203 of cord W203. The other end of cord W204 (which is twist-lock plug P204) is inserted into jack J208 of cord W205.

o. Loosen the needle clamp screw on the reproducer head (E101) and insert the blunt end of the needle into the hole. Tighten the clamp screw after the needle has been pushed up as far as it will go.

Caution: Be careful not to drop the reproducer head on the record or turntable surface. Also avoid pushing the needle to either side.

PART TWO

OPERATING INSTRUCTIONS

Note. For information on destroying the equipment to prevent enemy use, refer to the destruction notice at the front of the manual.

Section III. CONTROLS AND THEIR USE

8. Amplifier Controls (Fig. 3)

a. MICROPHONE 1 AND MICROPHONE 2 (R4 AND R5). MICROPHONES 1 and 2 are identical gain controls mounted on the upper left of the amplifier panel. MICROPHONE 1 is the gain control for both high- and low-impedance input jacks J1 and P1 of MICROPHONE 1 (marked HI–IMP–MIC–1 and LOW–IMP–MIC–1). MICROPHONE 2 is the gain control for both high- and low-impedance input jacks (J2 and P2) of MICROPHONE 2 (marked HI–IMP–MIC–2 and LOW–IMP–MIC–2). Turning this knob clockwise increases the signal voltage from Microphone M–2/U to the amplifier. Turning the knob counterclockwise decreases the signal voltage.

b. PHONO OR LINE (R25). PHONO OR LINE is a gain control. When turned clockwise, it increases the signal voltage from the phono pick-up (reproducer) mounted on Turntable MX–39/TIQ–2 or from an external 100-ohm line inserted into jack J3 (marked PHONO OR LINE) which is fed to the amplifier.

c. TONE (R9). Turning the control marked TONE increases the bass or treble response of the amplifier output.

d. RADIO OR CARBON MIC (R26). The gain control marked RADIO OR CARBON MIC is used to control the amplifier input from a radio or carbon microphone, whichever is used. When turned clockwise, gain is increased. When turned counterclockwise, gain is decreased.

e. RADIO-C MIC (S1). The RADIO-C MIC switch connects either RADIO jack J5 or CARBON MICROPHONE jack J4 into the circuit. With the switch in RADIO position, RADIO jack J5 is in the circuit and CARBON MICROPHONE jack J4 is disconnected from the circuit. With switch in C MIC position, CARBON MICROPHONE jack J4 is in the circuit and RADIO jack J5 is disconnected.

f. OFF-ON (S3). The OFF-ON switch is the power switch for the amplifier. It connects or disconnects the amplifier from the power source.

g. 115–230 (S2). Switch 115–230 is a power selector control that can be locked in the desired position. When the amplifier is used with a 115-volt, 60-cycle, a-c source, this switch must be locked in the 115 position. When a 230-volt, 60-cycle, a-c source is used, this switch must be locked in the 230 position.

9. Turntable Controls (Fig. 6)

a. 115–OFF–230 SWITCH. Switch 115–OFF–230 is the voltage selector and POWER switch for the turntable unit. When in the OFF position, the turntable motor and heater are disconnected from the power source. For operation from a 115-volt, a-c source, the switch is placed in the 115 position. The locking plate must then be set to prevent the switch from being snapped into the 230 position. When a 230-volt, 60-cycle power source is used, the switch is placed in the 230-volt position and the locking plate changed to the location where it prevents the switch from being snapped to the 115-volt position.

b. MOTOR SWITCH. The MOTOR switch (S103) is used to start and stop the turntable motor. The motor switch is not effective unless the POWER switch is in either the 115- or 230-volt position.

Section IV. OPERATION

Note. Before connecting Public Address Set AN/TIQ–2 to a power source be sure the power receptacle is either 115 or 230 volts, 60 cycles and that voltage selector switches on the amplifier and turntable units are adjusted accordingly. Unused HI–IMP–MIC–1 and HI–IMP–MIC–2 jacks must be kept covered with their respective screw caps.

10. Starting Procedure

a. GENERAL. (1) Make all interconnections properly. (See par. 7.)

(2) Insert plug P205 into any standard 115- or 230-volt, 60-cycle receptacle.

b. AMPLIFIER AM–20/TIQ–2. (1) Check the power selector switch (S2) for voltage setting used and set switch if necessary.

(2) Turn all gain controls to 0.

(3) Throw power switch (S3) to ON.

c. TURNTABLE MX–39/TIQ–2. (1) Pull out the turntable drawer.

(2) Place POWER switch marked 115–OFF–230 (S102) in either 115 or 230 position (depending on what the source voltage is).

Note. After operation, the switch marked POWER *should be kept* in the 115 or 230 position if phono heater operation is desired.

(3) Throw MOTOR switch toggle to ON.

(4) Set turntable speed controls for desired speed (78 or 33-1/3 rpm).

11. Operating Procedure

a. For Use as Public Address System. (1) If HI–IMP–MIC–1 or LOW–IMP–MIC–1 (J1 or P1) is used for the microphone control connection, adjust the control marked MICROPHONE 1 (R4) for desired output level in the speakers.

(2) If HI–IMP–MIC–2 or LOW–IMP–MIC–2 (J2 or P2) is used for the microphone connection, adjust the control marked MICROPHONE 2 (R5) for desired output level.

(3) Adjust tone control as required.

Note. If gain controls MICROPHONE 1 or MICROPHONE 2 are positioned too far clockwise, a howling, whistling sound may be heard. This sound, known as acoustic feedback, is caused by the speaker output (reflected from surrounding walls, trees, or ground) entering the microphone. Feedback may be reduced or eliminated by placing the speakers in front of the microphone and facing away from it. If feedback still occurs, turn gain controls counterclockwise to a point just before feedback occurs.

(4) Position the lips about 6 inches from the microphone grill and speak naturally.

b. Playing Recordings. (1) Place desired record on withdrawn turntable, throw POWER switch marked 115–OFF–230 to 115 (or 230 if the line voltage is 230 volts) and throw MOTOR switch to ON.

(2) Set speed controls at proper speed (most commercial recordings are played at 78 rpm).

(3) Lift the reproducer head (phono pickup) and gently place its attached needle on the first groove of the recording.

(4) Adjust control marked PHONE OR LINE (on the amplifier panel) for volume level desired. Adjust control marked TONE for desired bass or treble response.

(5) When recording is played do not allow the needle to ride in the last groove longer than necessary. Lift gently and place the reproducer head back on its support at the right side of the cabinet.

c. For Use with Radio (Other Than Radio Receiver R–100/URR (par. 41)). (1) Connect a Plug PL–55 to the two conductors on one end of a two-conductor cable.

(2) Attach a terminal of a 0.1-microfarad (mf) capacitor to the end of one conductor (which is connected to tip of PL–55) at the other end of the cable.

(3) Connect the free end of the capacitor to the plate of the second detector of the radio receiver. Connect the other conductor of the cable to the chassis of the radio receiver.

(4) Insert Plug PL–55 into RADIO jack (J5) on the amplifier panel.

(5) Throw RADIO-C MIC switch (S1) to RADIO position.

(6) Adjust RADIO OR CARBON MIC control to the proper setting.

d. For Use With Carbon Microphone. (1) Throw switch marked RADIO-C MIC to C MIC position.

(2) Turn control marked RADIO OR CARBON MIC to 0.

(3) Plug a single button carbon microphone into jack marked CARBON MICROPHONE on the amplifier panel.

Note. A double-button carbon microphone may be used, but only one side of the microphone will be effective. The impedance of the carbon microphone input circuit is 100 ohms.

(4) Tap side of the microphone and turn up the gain control marked RADIO OR CARBON MIC until sound is heard from speakers.

(5) Blow into both sides of a double-button microphone and use the side of the microphone that produces sound from the speaker. Position the lips about 1 foot in front of the microphone and speak in a natural manner. Adjust control marked RADIO OR CARBON MIC until desired volume is obtained. Adjust control marked TONE for desired tonal emphasis. A treble tone is usually best for most voices.

Note. Amplifier AM–20–TIQ–2 may be monitored with a headset by inserting the headset plug into the MONITOR jack on the amplifier panel.

e. For Use with Booster Amplifier. Refer to paragraph 40 for method of using a booster amplifier.

12. Shut-down Procedure

a. Throw both power switches to OFF. (See note below.)

b. If equipment is not to be used for a long time, disconnect and return all cables and interconnections to their respective compartments. (See fig. 10.)

Note. If operation of the heater in the turntable unit is desired, keep the POWER 115–OFF–230 switch toggle in either the 115 or 230 position (depending on line voltage used). Throwing the toggle to OFF will disconnect the heater unit from the power source.

Section V. EQUIPMENT PERFORMANCE CHECK LIST

13. Purpose and Use of Check List

a. General. Use of the equipment performance check list will help the operator to determine whether Public Address Set AN/TIQ–2 is functioning properly. Listed are the *items* to be checked, the *actions* to be performed on the items (or *condition* of the

items at the time, the *normal indications* of correct operation, and the corrective measures that the operator should take if the indications are not normal.

b. ACTION OR CONDITION. For some *items* the information given in the *action or condition* column consists of the settings of various switches and controls under which the item is to be checked. For other items it represents an action that must be taken in order to check the *normal indication* given in the normal indication column.

c. NORMAL INDICATIONS. The *normal indications* listed include the visible and audible signs that the operator will perceive when he checks the items. If the indications are not normal, the operator should apply the recommended *corrective measures.*

d. CORRECTIVE MEASURES. The *corrective measures* are those that the operator can make without turning the equipment in for repairs. If the set is completely inoperative and the recommended *corrective measures* do not yield results, trouble shooting may be necessary. Trouble-shooting information will be found in part five of this manual.

14. Equipment Performance Check List

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	Cables and cords.	Connect all components (par. 7).	All connectors and plugs are firmly attached.	Tighten collars on connectors and push plugs fully into jacks.
	2	Cable W205 (fig. 7).	Plug cable W205 into a-c receptacle.		
	3	Power switch (fig. 3).	Throw to ON.	Pilot lamp lights and blower motor operates.	Replace pilot lamp. Check fuse F1. Check power receptacle for power.

a. Using Equipment as Public Address Set.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
OPERATION	4	Microphone M–2/U (Cables W208 and W207).	Plug into LOW–IMP–MIC –1 (and 2 if two microphones are used).		
	5	MICROPHONE 1 or MICROPHONE 2 controls.	Turn clockwise about 1/3 the dial travel.	Slight hiss should be heard coming from speaker when blowing into microphone.	Turn gain controls (LOW–IMP–MIC–1 or 2) up to higher number. Push microphone connector firmly into jacks. If howl is heard, turn down both controls, or reposition speakers or microphones.

b. PLAYING RECORDINGS.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
OPERATION	6	Speed controls (fig. 6).	Set to desired speed.		
	7	115–OFF–230 switch.	Throw to 115 or 230 (par. 10).		
	8	MOTOR switch.	Throw to ON.	Turntable should rotate.	Check fuse F101. Check power cord and connector.
	9	Reproducer head (phono pick-up).	Place into first groove of recording		
	10	PHONO or LINE control.	Adjust to volume level desired.	Recording is heard.	Check tubes in amplifier. Check all connectors and plugs.
	11	115-OFF-230 switch.	Throw to OFF.	Turntable stops rotating.	Check switch for short circuit.

c. PLAYING RADIO SET THROUGH AMPLIFIER.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
OPERATION	12	Plug PL–55 (connected to radio detector).	Plug into RADIO jack on amplifier panel.		
	13	RADIO–C MIC switch.	Throw to RADIO.		
	14	RADIO or CARBON MIC control.	Turn clockwise.	Slight hiss or hum may be heard.	Check cord from radio to amplifier. Turn up gain control.
	15	Radio set.	Tune set to desired station and advance radio volume control.	Radio program should emanate from speaker.	Check radio set. Check capacitor connection to detector output.
	16	Radio set power switch.	Turn to OFF.	Radio program stops coming through speaker.	Check radio set power switch.

d. USING CARBON MICROPHONE.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
OPERATION	17	Carbon microphone.	Plug microphone into CARBON MICROPHONE jack on amplifier.		
	18	RADIO–C MIC switch.	Throw to C MIC.		
	19	RADIO or CARBON MIC control.	Blow into microphone grill opening and advance RADIO or CARBON control.	Hissing sound emanates from speaker as operator blows into microphone.	Check all connections and positions of RADIO-C MIC switch and TONE CONTROL (hissing sound will be deadened if TONE CONTROL setting is BASS).
SHUT DOWN	20	Power switch (on amplifier panel).	Turn to OFF.	Pilot lamp goes out and blower motor becomes silent.	Check power switch for short.

PART THREE
MAINTENANCE INSTRUCTIONS

Section VI. PREVENTIVE MAINTENANCE TECHNIQUES

15. Meaning of Preventive Maintenance

Preventive maintenance is a systematic series of operations performed at regular intervals on equipment, when turned off, to eliminate major break-downs and unwanted interruptions in service, and to keep the equipment operating at top efficiency. Preventive maintenance is of utmost importance, therefore it is vitally important that operators and repairmen maintain their equipment properly.

Note. The operations in section VI and VII are first and second echelon (organization operators and repairmen) maintenance. Some operations in section X are higher echelon maintenance.

16. Description of Preventive Maintenance Techniques

a. GENERAL. (1) Most of the electrical parts used in Public Address Set AN/TIQ–2 require routine preventive maintenance. Some parts require more maintenance than others. Some require maintenance of a different kind. Hit-or-miss maintenance techniques cannot be applied; definite and specific instructions are needed. This section of the manual contains these specific instructions and serves as a guide for personnel assigned to perform the six basic maintenance operations: Feel, Inspect, Tighten, Clean, Adjust, and Lubricate. Throughout part three of this manual the lettering system for the six operations will be as follows:

F—Feel
I—Inspect
T—Tighten
C—Clean
A—Adjust
L—Lubricate

(2) The first two operations show when the other four are needed. Selection of operations is based on a general knowledge of field needs. For example, the dust encountered on dirt roads during cross-country travel filters into the equipment no matter how much care is taken to prevent it. Rapid changes in weather (such as heavy rain followed by blistering heat), excessive

dampness, snow, and ice tend to cause corrosion of exposed surface parts. Without frequent inspections and the necessary performance of tightening, cleaning, and lubricating, equipment becomes undependable and may break down when it is needed most.

b. FEEL. The feel operation is used most often to check rotating machinery, such as the turntable and blower motors and to determine whether electrical connections and bearings are overheated. Feeling will show the need for lubrication or the existence of other defects requiring correction. The maintenance man must become familiar with normal operating temperatures of motors, etc., in order to recognize signs of overheating.

Note. It is important to perform feel operation as soon as possible after shut-down and always before any other maintenance is done.

c. INSPECT. Inspection is the most important operation in preventive maintenance. A careless observer will overlook evidences of minor trouble. Although these defects may not at the moment interfere with the performance of the equipment, valuable time and effort can be saved if they are corrected *before* they lead to major break-downs. To be able to recognize the signs of a defective set, make every effort to become thoroughly familiar with the indications of *normal* functioning. Inspection consists of carefully observing all parts of the equipment, noticing their color, placement, state of cleanliness, moisture accumulations, etc. Inspect for the following conditions:

(1) Overheating, as indicated by discoloration, blistering, or bulging of the parts or surface of the container; leakage of insulating compounds; and oxidation of metal contact surfaces.

(2) Placement, by observing that all leads and cabling are in their original positions.

(3) Cleanliness, by carefully examining all recesses in the units for accumulation of dust, especially between connecting terminals. Parts, connectors, and joints should be free of dust and other foreign matter. In tropical or high-humidity locations, look for fungus growth, mildew, and moisture accumulations.

(4) Tightness, by testing any connection or mounting which appears to be loose.

d. TIGHTEN, CLEAN, AND ADJUST. These operations are self-explanatory. Specific procedures to be followed in performing them are given wherever necessary throughout part three.

Caution: Screws, bolts, and nuts should be tightened carefully. Fittings tightened beyond the pressure for which they are designed will be damaged or broken.

Whenever a loose connection is tightened, it should be weatherproofed again by applying the protective varnish with a small

brush. See section IX for details of weatherproofing the public address set.

e. LUBRICATE. Lubrication refers to the application of grease or oil to the bearings of motors or rotating shafts. It may also mean the application of a light oil to door hinges or other sliding surfaces on the equipment.

Section VII. ITEMIZED PREVENTIVE MAINTENANCE

17. Introduction

For ease and efficiency of performance, preventive maintenance on Public Address Set AN/TIQ–2 will be broken down into operations that can be performed at different time intervals. In this section, the preventive maintenance work to be performed on Public Address Set AN/TIQ–2 at the specific time intervals is broken down into units of work called items. The general techniques involved and the application of the FITCAL operations in performing preventive maintenance on individual parts are discussed in section VI and are not repeated in this section. Refer to section VI if more information is required for the following items. Perform all work with the power removed from the equipment. After preventive maintenance has been performed on a given day, put the equipment into operation and check it for satisfactory performance. (See par. 14.)

18. Preventive Maintenance Materials

The following preventive maintenance materials will be needed:

Clean cloth.
No. 0000 sandpaper.
Dry-cleaning solvent (SD).

Note. Gasoline will not be used as a cleaning fluid for any purpose.

19. Item 1, Vacuum Tubes and Sockets

Note. Do not work on the tubes immediately after shut-down. Severe burns may result from contact with the envelopes of hot tubes.

a. INSPECT. (I). (1) Inspect the tube envelopes for accumulation of dirt and for corrosion. Replace tubes that have loose envelopes.

(2) Inspect firmness of tubes in their sockets. Make the inspection by pressing the tubes down in sockets and testing them in that position. Partially withdrawing the tubes and jiggling them from side to side tends to weaken the tube-base pins and spreads the socket contacts. Inspect the tube sockets at the time the tubes are removed.

(3) Be careful when removing a tube from its socket. Never jar a warm tube.

b. TIGHTEN (T). Tighten all loose connections to the tube sockets. If connections are dirty or corroded, clean them before tightening.

c. CLEAN (C). (1) Remove dust and dirt from the tube envelopes with a clean, lint-free dry cloth.

(2) When tube sockets are cleaned and the contacts are accessible, No. 0000 sandpaper may be used to remove corrosion, oxidation, and stubborn dirt.

20. Item 2, Capacitors

a. INSPECT. (I). (1) Inspect the terminals of large fixed capacitors for corrosion and loose connections. Carefully inspect the mountings for loose mounting screws. Examine the leads for poor insulation, cracks, and dry rot. Cut away frayed strands on the insulation. If the wire is exposed, wrap it with friction tape. The terminals of the capacitors should not be cracked or broken.

(2) Thoroughly inspect the case of each large fixed capacitor for leaks, bulges, and discoloration.

b. TIGHTEN. (T). Tighten loose terminals, mountings, and connections on the capacitors.

c. CLEAN (C). Clean the cases of fixed capacitors, the insulating bushings, and all connections that are dirty or corroded. The capacitor cases and bushings can usually be cleaned with a dry cloth. However, if the deposit of dirt is difficult to remove, rub with a cloth moistened with solvent, drycleaning (SD).

21. Item 3, Potentiometers

a. INSPECT (I). The mechanical operation of all potentiometers (gain and tone controls) should be checked. Inspect the assembly and mounting nuts. All metallic parts should be inspected for dust, dirt, and corrosion.

b. TIGHTEN (T). Tighten all loose assembly nuts.

c. CLEAN (C). Wipe the potentiometers with a clean cloth.

22. Item 4, Resistors

a. INSPECT (I). Inspect the bodies of the resistors for blistering and discoloration (this usually indicates overheating). Inspect all connections for corrosion, dirt, dust, and looseness. Look for broken strands in the connecting wires. Inspect the connections for proper soldering.

b. CLEAN (C). Clean pigtail resistors with a small brush and SD.

23. Item 5, Switches

a. INSPECT (I). Inspect all connecting wires for broken insulation and poor soldering.

b. TIGHTEN (T). Tighten all switch mounting nuts.

c. CLEAN (C). Wipe all switches with a dry clean cloth. Use SD, if necessary.

24. Item 6, Air Filter

a. INSPECT (I). Inspect mesh and filter material for loose strands or large holes. Replace if damaged beyond repair.

b. TIGHTEN (T). Tighten the clips holding the filter to the chassis.

c. CLEAN (C). Tap all dust and dirt from the filter element. Swish the element in SD.

d. LUBRICATE (L). See paragraph 36.

25. Item 7, Blower Motor

a. FEEL (F). Feel the blower motor as soon as equipment is shut down. Experience will determine the degree of heat that indicates an abnormal condition. The motor will run cooler in more temperate climates, and allowances should be made accordingly. Consider other factors such as vibration, smooth starting, and noisy operation before condemning a hot motor.

b. INSPECT (I). Check for discoloration of the motor housing. Look for loose mountings and dirt. Check condition of wiring to motor for fraying and deterioration.

c. TIGHTEN (T). Tighten all mounting hardware.

d. CLEAN (C). Remove all dirt from motor housing. Use SD if dirt is stubborn.

e. LUBRICATE (L). No lubrication is required.

26. Item 8, Microphones M–2/U

a. INSPECT (I). Inspect both Microphones M–2/U for dirt and cracks.

b. CLEAN (C). Clean the housing of each Microphone M–2/U with a clean dry cloth.

Note. Do not disassemble the microphone.

27. Item 9, Loudspeaker and Microphone Stands

a. INSPECT. (I). Inspect the loudspeaker stands for cracks and excessive dirt. Test the legs at all lengths to be certain the catches hold.

b. CLEAN (C). Clean all dirt, dust, or moisture from the legs. Be sure the wingbolts are not stuck and are free to move.

28. Item 10, Loudspeakers LS–103/TIQ–2

a. INSPECT (I). (1) Inspect Loudspeakers LS–103/TIQ–2 for accumulations of dust, dirt, and other foreign matter.

(2) Inspect the terminal thumbscrews at the rear for loose or broken connections.

(3) Inspect the mating surfaces between the horn and driver unit for dirt and corrosion.

(4) Inspect the action of the catches.

b. CLEAN (C). Clean all dirt, dust, and lint from the speaker with a clean dry cloth.

29. Item 11, Cables and Cords

a. INSPECT (I). Inspect the cables and cords for cracks and deteriorated insulation; also check for frayed or cut insulation at the connecting points.

b. TIGHTEN (T). Tighten all cable connectors, plugs, and clamps.

c. CLEAN (C). Clean all dirty and corroded connectors, plugs, and clamps with SD, and if necessary, with No. 0000 sandpaper.

30. Item 12, Turntable Motor and Reproducer Head

a. FEEL (F). Feel the turntable motor for excessive heat. The motor will be hot to the touch after several hours use in hot weather. Make allowances for the lack of ventilation and other factors that might cause excessive heating of the motor.

b. INSPECT (I). Check the motor housing for excess dirt and oil. Check the wires from the switch and transformer terminals. Check all soldered joints and connections for imperfect welds and rosin-held splices. Inspect the thermostatic switch and connectors.

c. TIGHTEN (T). Tighten all loose clamps, mounting nuts, and screws. Tighten speed control clamps. Tighten the mounting screws on the reproducer-head arm.

d. CLEAN (C). Wipe the motor housing with a dry, clean, lint-free cloth. If dirt is stubborn, use SD. Wipe all wires adjacent to the motor and remove oil soak. Clean the area under the turntable and around the oil holes. Clean the reproducer head.

e. LUBRICATE (L). See paragraph 37.

31. Item 13, Cases and Control Panels

a. INSPECT (I). Inspect all the cases and control panels for dirt. Check catches on sides and covers of all cases. Check for chipped paint and cracked wood. Inspect the weatherproof gasket on all covers for tears and deterioration. Inspect all knobs for free rotation on their respective shafts. Remove the fuses and inspect for corrosion; make sure they fit tight in their holders. Check the pilot lamp jewel for dirt and cracks. Check all panel-mounted connectors and jacks for dirt and corrosion. Check their mounting screws or nuts for looseness.

b. TIGHTEN (T). Tighten all loose mounting nuts and screws. Tighten nuts on all case catches, handles, and metal bands.

c. CLEAN (C). Clean the amplifier and turntable panels with a soft clean cloth. Use SD if necessary. Wipe all cases with a damp cloth. If the cases are muddy, use a brush and water. Be sure to install all covers on the cases being cleaned.

d. LUBRICATE (L). Apply a few drops of oil, engine, to fasteners, hinges, and latches.

32. Preventive Maintenance Check List

The following check list is a summary of items of preventive maintenance described in section VII. Time intervals between jobs may be shortened or extended by local commanders in accordance with conditions. However, for best results, perform operations as scheduled in the check list. The echelon column indicates which operations are first echelon maintenance and which operations are second echelon maintenance. Operations are indicated by the letters of the word FITCAL. For example, if the letters ITCA appear in the operation column, the item to be treated must be inspected (I), tightened (T), cleaned (C), and adjusted (A).

Item No.	Operation	Item	Before operation	Monthly	Echelon
1	ITC	Tubes and sockets		X	2d
2	ITC	Capacitors		X	2d
3	ITC	Potentiometers		X	2d
4	IC	Resistors		X	2d
5	ITC	Switches		X	2d
6	ITCL	Air filter		X	2d
7	FITCL	Blower motor		X	2d
8	IC	Microphones M–2/U	X		1st
9	IC	Loudspeaker and microphone stands	X		1st
10	IC	Loudspeakers LS–103/TIQ–2	X		1st
11	ITC	Cables and cords	X		1st
12	FITCL	Turntable motor and reproducer head		X	2d
13	ITCL	Cases and control panels	X		1st

F Feel — I Inspect — T Tighten — C Clean — A Adjust — L Lubricate

Note: X indicates when operations are to be performed.

Section VIII. LUBRICATION

33. Approved Lubricants and Cleanser

The following lubricants and cleanser will be used:

Symbols	Standard nomenclature
GL	Grease, Lubricating, Special or Navy spec OS–1350.
PL	Oil, Lubricating, Preservative, Special or Navy spec OS–1361.
OE	Oil, Engine SAE–10 or Navy symbol 9110.
SD	Solvent, Dry-Cleaning.

Note: OE–10 may be substituted for PL when high temperature thins PL.

34. General Lubrication Information

a. CLEANING. Clean parts with a lint-free cloth or a pipe cleaner moistened with SD. Allow parts to dry thoroughly before applying lubricant.

Note. Gasoline will not be used as a cleaning fluid for any purpose.

b. LUBRICATING. Do not lubricate excessively. Lubrication points difficult to reach may be lubricated with the aid of a small bare wire formed into a loop at one end.

c. INTERVALS. Intervals between lubrication days (as stated in the lubrication procedures in this section) are maximum and are based on normal, 8-hour day operation of the public address set. For abnormal conditions or activities, intervals should be shortened to compensate for additional wear.

d. ABNORMAL CONDITIONS. Operation of the public address set under severe dust, moisture, heat, and cold conditions affect the equipment in such a manner that special preventive measures are necessary to prolong the life of moving parts. Refer to section IX for more detailed information.

35. Lubricating Blower Motor

The sealed ball bearings used in the blower motor do not require lubrication. In the event of motor failure, replace the entire unit.

36. Lubricating Air-filter Element

Although the filter element is inspected every month, clean and lubricate only if the amount of dirt on the element prevents the passage of air. This condition may be determined by looking through the filter element at a bright light. If light fails to penetrate the dirt covering, clean and relubricate as follows:

a. Remove the air-filter element.

b. Tap the element to remove loose dirt.

c. Wash the element in SD and allow to dry thoroughly.

d. Dip the element in OE–10 and allow to drain. Wipe off excess lubricant before reinstalling the element in the amplifier.

37. Lubricating Turntable Motor

Lubricate the turntable motor once a month as follows (fig. 7) :

a. Slide out the turntable unit and remove the turntable locking clip that holds the turntable to the spindle. Lift off the turntable. Three oil holes will be visible.

b. Apply 2 to 3 drops of PL to each of the three holes.

c. Wipe off excess oil around the holes and examine the motor for dirt. Clean if necessary with SD.

d. Reassemble the turntable and slide the turntable unit back into its case.

Note. If inspection indicates need for lubrication of the phono motor, refer to paragraph 60.

Section IX. WEATHERPROOFING OF EQUIPMENT

38. Moistureproofing and Fungiproofing

a. GENERAL. (1) When equipment is operated in highly humid climates, excessive failure of parts and decreased operating efficiency are usually caused by the accumulated effects of moisture, rather than by inferior parts. Rapid temperature changes accompanied by fog, rain, dew, or high humidity promote such failures.

(2) The effects of moisture on resistors, capacitors, coils, chokes, transformer windings, terminal boards, and insulating strips can be recognized in the form of corrosion, low insulation resistance, and flash-over. Moisture also accelerates fungus growth, which increases these effects.

b. REDUCING FAILURES. (1) A moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. The treatment consists of applying a film of moisture- and fungi-resistant varnish to all susceptible parts of the equipment. This film provides a nonwetting surface. Equipments which have been treated have been marked with the letters MFP and the date of treatment. Equipments not marked should be examined, and if treatment has not been applied, the equipment should be returned to third or higher echelon maintenance units for treatment.

(2) TB SIG 13 contains a detailed description of this treatment.

(3) Retreatment may be required after a period of use. Need for this treatment is indicated by excessive failures or by the effects listed in *a*(2) above.

c. Treating Public Address Set AN/TIQ–2. Use the procedure outlined in TB SIG 13 to moistureproof and fungiproof Public Address Set AN/TIQ–2. The following should be noted.

(1) The blower-motor assembly should not be baked or treated. Excessive heating of the blower motor will ruin the lubricant used in the sealed ball bearings. Remove the blower-motor assembly before treating the amplifier.

(2) Remove the filter element before treating the amplifier.

d. Treating Equipment After Repairs. If the coating of protective varnish has been punctured or broken during repair, and if complete treatment is not needed to reseal the equipment, brush-coat the affected part. Be sure the break is completely sealed.

Note. Public Address Set AN/TIQ–2 is moistureproofed and fungiproofed and should not require further treatment in the field. If corrosion and fungus growth appear after a short period of operation, treat the equipment as described in TB SIG 13.

39. Weatherproofing of Equipment

a. Tropical Operation. Public Address Set AN/TIQ–2 is adequately protected against failure in the tropics by the varnish coating of moistureproof and fungiproof material.

b. Desert Operation. TB SIG 75 gives the necessary precautions to observe in order to prevent equipment failure due to heat and dust. More frequent inspection of the air-filter element is necessary since more dust- and sand-laden air passes through the filter under desert conditions. The passage of air through the filter must be maintained at all times during operation.

c. Cold-Weather Operation. Public Address Set AN/TIQ–2 is designed to operate in very low temperature. Additional warm-up time must be allowed if the turntable motor is slow in starting. (The turntable-motor gears are coated with grease which will require heating from the inclosed thermostatically controlled heating element.) Keep the current on some time before operation. Refer to TB SIG 66 for cold-weather operation data.

PART FOUR
AUXILIARY EQUIPMENT

Section X. BOOSTER AMPLIFIER

40. Booster Amplifier (Fig. 17)

a. GENERAL. Provision is made in the design of Amplifier AM–20/TIQ–2 to tap the output transformer secondary output voltage for use as an input signal to another amplifier for purposes of obtaining added coverage of Public Address Set AN/TIQ–2. Since only one Amplifier AM–20/TIQ–2 (the main amplifier) is supplied with the public address set, it will be necessary to use another Amplifier AM–20/TIQ–2 as a booster amplifier.

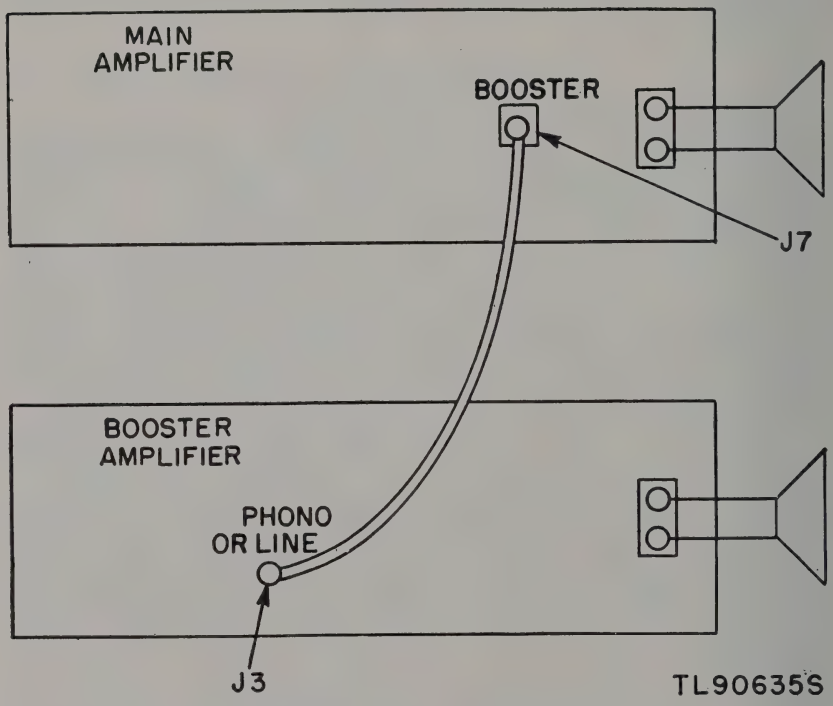

Figure 17. Connections for booster amplifier.

b. PANEL CONNECTIONS. (1) *BOOSTER connector.* The connector marked BOOSTER (J7) on the main amplifier is connected to the output transformer of that amplifier. Contact is made

through suitable resistors so that the output impedance across pins D and A of connector J7 is 100 ohms. Pin D of the connector marked BOOSTER is connected to the output transformer. Pin A is grounded. (See fig. 21.)

(2) *PHONO OR LINE jack.* The PHONO OR LINE jack (J3) on the booster amplifier is connected to the input of that amplifier. Connection is made from the output of the main amplifier through the connector marked BOOSTER to this jack marked PHONO OR LINE which is mounted on the booster amplifier.

c. INSTALLATION OF BOOSTER AMPLIFIER. (1) *Connecting cord.* Attach a Plug PL–55 (Signal Corps stock No. 2Z7155) to one end of a shielded, single-conductor, rubber-covered cord (Signal Corps stock No. 1B825.1) of a suitable length. Carefully solder the conductor to the tip terminal on the plug. Connect the shield to the sleeve terminal. Solder the other end of the conductor to pin D of the male connector (Signal Corps stock No. 2ZK7115.4) and the shield to pin A, which is grounded.

(2) *Making connection.* Insert the plug end of the cord into the jack (on the panel of the booster amplifier) marked PHONO OR LINE and the other end of the cord into the connector of the main amplifier marked BOOSTER.

(3) *Speaker connections.* Disconnect the speaker from the main amplifier and reconnect to the speaker binding posts of the booster amplifier.

d. OPERATING BOOSTER AMPLIFIER. (1) Turn the PHONO OR LINE control on the booster amplifier panel to 0.

(2) Throw the power selector switch on the booster amplifier to the voltage corresponding to the line voltage of the power source (either 115 or 230 volts).

(3) Prepare the main amplifier for operation as described in paragraph 10.

(4) Throw the booster power switch to ON.

(5) Speak into the microphone or place the turntable reproducer on recording and gradually turn up the gain control on the booster marked PHONO OR LINE until the desired volume is obtained. It may be necessary to advance either the MICROPHONE 1 or the MICROPHONE 2 gain control (or the control marked PHONO OR LINE) on the panel of the main amplifier to produce the desired output.

e. SHUTTING DOWN BOOSTER AMPLIFIER. (1) Throw the power switch on the main amplifier to OFF.

(2) Throw the power switch on the booster amplifier to OFF.

Section XI. RADIO RECEIVER R–100/URR

41. Radio Receiver R–100/URR (Fig. 18)

a. DESCRIPTION. Radio Receiver R–100/U is an eight-tube, three-band, a-c, d-c, and battery receiver housed in a metal case. One band covers the regular broadcast range (550 kc to 1,560 kc). A wire, permanently attached to the radio set, serves as the antenna. Spare fuses are mounted on the inside of the small door at the rear of the metal cabinet. This door is opened to gain access to the two fuse holders and the 115–230-volt switch. A diagram of the set is pasted on the inside of the cabinet rear plate.

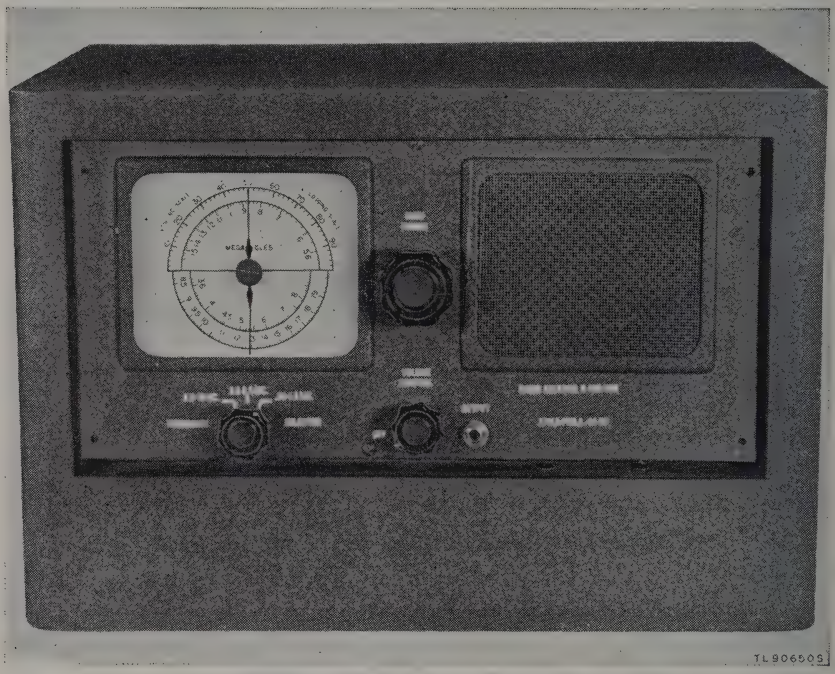

Figure 18. Radio Receiver R–100/URR.

b. INSTALLATION. (1) *A-c, d-c operation.* Check the line voltage. Throw the 115–230-volt switch to the figure corresponding to the line voltage. Throw AC-DC BATT switch to AC-DC.

(2) *Battery operation.* Install batteries as described in Changes No. 6, TM 11–310, or on diagram in radio set. Throw AC-DC BATT switch to BATT.

c. OPERATION. Unwind the antenna from the hooks at the rear of the set and extend it as high as possible above the ground. Connect the ground wire to the GND binding post. *Make sure*

no bared portion of the ground wire touches the radio chassis or metal cabinet. Turn the VOLUME CONTROL knob clockwise about halfway along its travel. Set the FREQUENCY SELECTOR knob to the desired wave band. Tune the station with the MAIN TUNING knob and adjust the volume of the received signal as desired. Turn off the set by rotating the VOLUME CONTROL knob completely counterclockwise until a click is heard.

d. USE WITH PUBLIC ADDRESS SET AN/TIQ–2. Radio Receiver R–100/URR may be used to furnish radio programs to large groups by connecting a portion of its audio output to the public-address-set input.

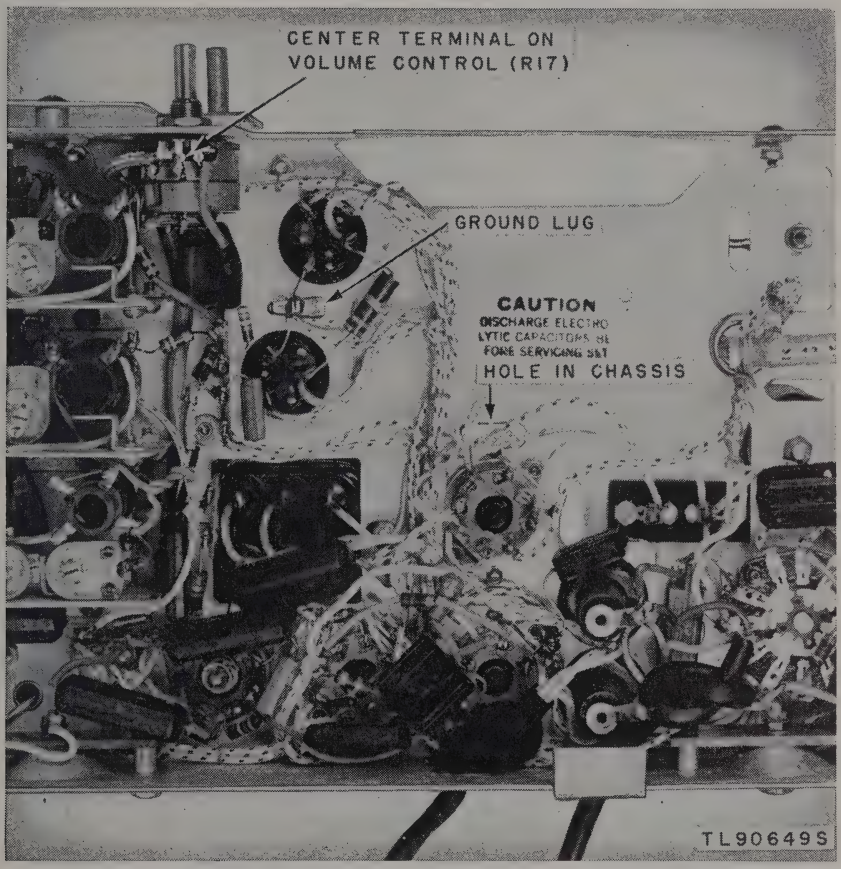

Figure 19. Radio Receiver R–100/URR, connection points.

e. MAKING CONNECTIONS INSIDE RADIO RECEIVER. (1) Disconnect the radio from the power source. Loosen the setscrews on the three panel knobs and remove the knobs from the shafts.

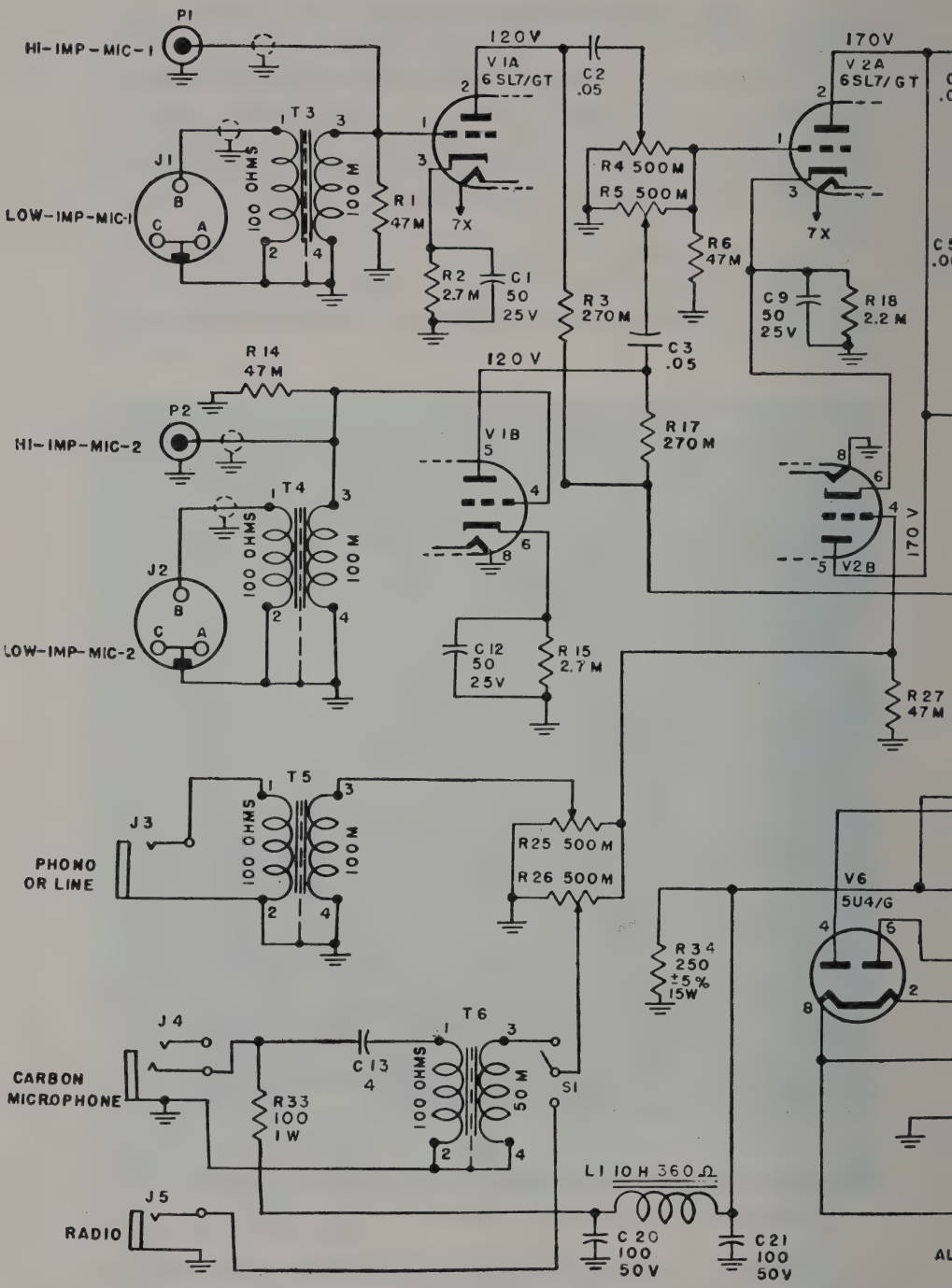

Figure 21. Amplifier A

TECHNICAL MANUAL

PUBLIC ADDRESS SETS AN/TIQ–2 AND AN/TIQ–2A

CHANGES No. 1

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 6 August 1948

TM 11–2586, 15 April 1947, is changed as follows:

The title of the manual is changed to read:

PUBLIC ADDRESS SETS AN/TIQ–2 AND AN/TIQ–2A

Figure 1. Public Address Set AN/TIQ–2. ***(The AN/TIQ–2A is similar except that spare parts Case CY–38/TIQ–2 (fig. 9) is not included.)***

Section I. DESCRIPTION

Note (Added). Public Address Sets AN/TIQ–2 and AN/TIQ–2A are similar except for certain minor equipment differences. The AN/TIQ–2A includes Amplifier AM–20A/TIQ–2, Case CY–37A/TIQ–2, and Loudspeaker LS–103A/TIQ–2 instead of similar components included with the AN/TIQ–2. Spare parts Case CY–38/TIQ–2 is not furnished with the AN/TIQ–2A. Information which applies to the AN/TIQ–2 in this manual also applies to the AN/TIQ–2A except where specified otherwise in these changes.

* * * * * * *

2. Technical Characteristics

a. AMPLIFIER AM–20/TIQ–2.

* * * * * * *

Output circuit	Vari-tapped output transformer with **600–(AM–20A/TIQ–2 only)**, 250-, 125-, 60-, and 30-ohm taps for speaker matching.

* * * * * * *

b. TURNTABLE MX–39/TIQ–2.

* * * * * * *

Power required	Approximately **25 w on AN/TIQ–2A and 25 w on AN/TIQ–2 with heater removed per MWO SIG 11–2586–1, 3 March 1948.**
Heat control	75-w heating unit controlled by thermostatic switch which closes heater circuit to power source at 45° F., and opens same circuit at 55° F.

* * * * * *

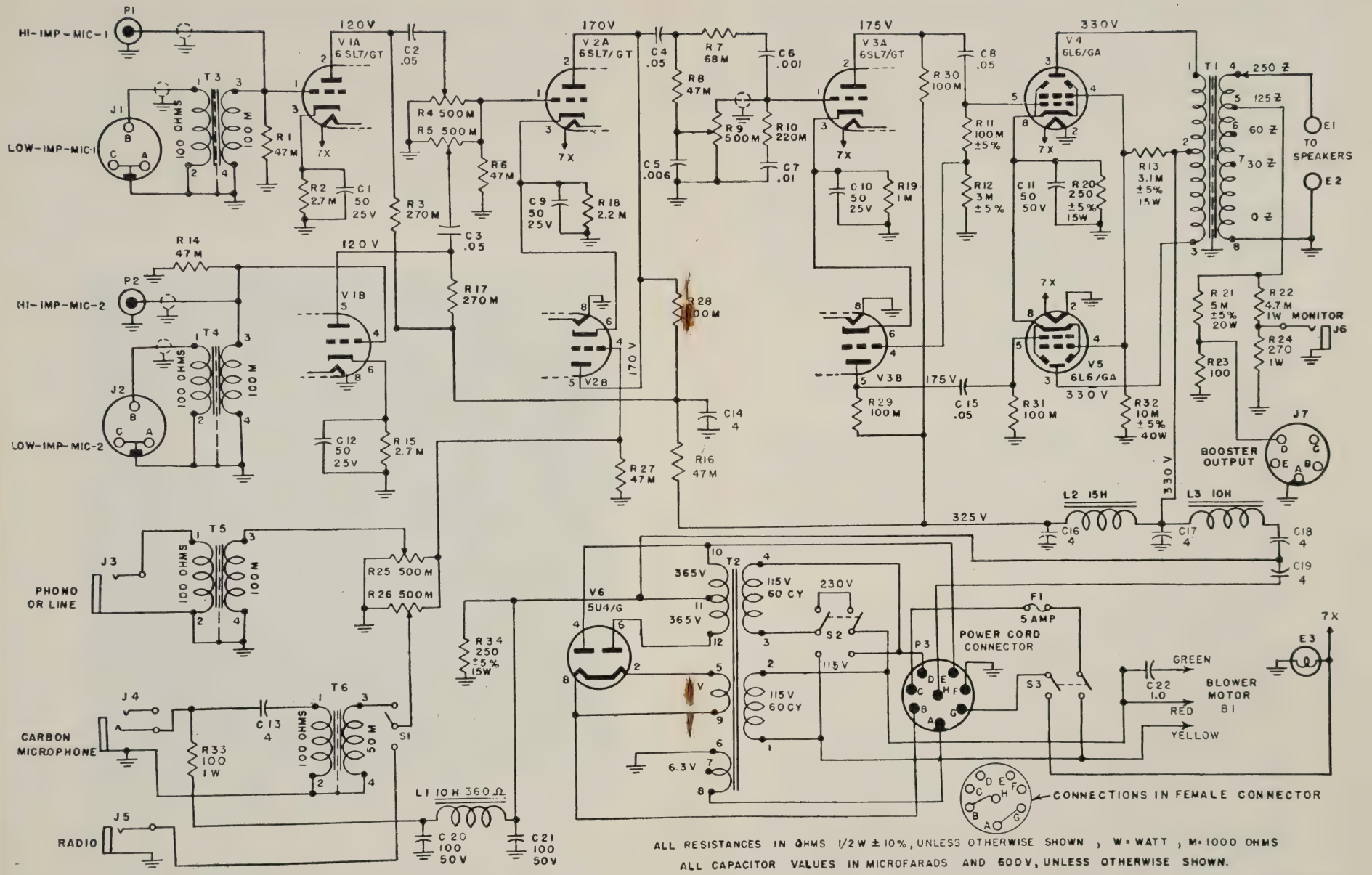

Figure 21. Amplifier AM-20/TIQ-2, schematic diagram.

TECHNICAL MANUAL

PUBLIC ADDRESS SETS AN/TIQ–2 AND AN/TIQ–2A

CHANGES No. 1

DEPARTMENT OF THE ARMY
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PUBLIC ADDRESS SETS AN/TIQ–2 AND AN/TIQ–2A

Figure 1. Public Address Set AN/TIQ–2. (***The AN/TIQ–2A is similar except that spare parts Case CY–38/TIQ–2 (fig. 9) is not included.***)

Section I. DESCRIPTION

Note (Added). Public Address Sets AN/TIQ–2 and AN/TIQ–2A are similar except for certain minor equipment differences. The AN/TIQ–2A includes Amplifier AM–20A/TIQ–2, Case CY–37A/TIQ–2, and Loudspeaker LS–103A/TIQ–2 instead of similar components included with the AN/TIQ–2. Spare parts Case CY–38/TIQ–2 is not furnished with the AN/TIQ–2A. Information which applies to the AN/TIQ–2 in this manual also applies to the AN/TIQ–2A except where specified otherwise in these changes.

* * * * * * *

2. Technical Characteristics

a. AMPLIFIER AM–20/TIQ–2.

* * * * * * *

Output circuit	Vari-tapped output transformer with **600–(AM–20A/TIQ–2 only)**, 250-, 125-, 60-, and 30-ohm taps for speaker matching.

* * * * * * *

b. TURNTABLE MX–39/TIQ–2.

* * * * * * *

Power required	Approximately **25 w on AN/TIQ–2A and 25 w on AN/TIQ–2 with heater removed per MWO SIG 11–2586–1, 3 March 1948.**
Heat control	75-w heating unit controlled by thermostatic switch which closes heater circuit to power source at 45° F., and opens same circuit at 55° F.

* * * * * *

3. List of Components

a. Components

Component	Required No.	Height (in.)	Depth (in.)	Length	Weight (lb.)
* *	*	*	*	*	*
Case CY–37/TIQ–2 (Loudspeaker LS–103/TIQ–2) (AN/TIQ–2).	1	23	22	33¾ in.	151. 0
Case CY–37A/TIQ–2 (Loudspeaker LS–103A/TIQ–2) (AN/TIQ–2A)	**1**	**23¼**	**22⅞**	**33¾ in.**	**157.0**
Case CY–38/TIQ–2 (spare parts) **(AN/TIQ–2 only)**	1	10	16	21 in.	36. 0
Loudspeaker LS–103/TIQ–2 **or LS–103A/TIQ–2**	2		19 diam.	25 in.	22. 0 ea.
* *	*	*	*	*	*
Microphone stand (AN/TIQ–2)	2				4.0 ea.
Microphone Stand MT–596/U (AN/TIQ–2A).	**2**	**26¼ to 78**			**4.0 ea.**
* *	*	*	*	*	*
Cord CX–50/TIQ–2	2			25 ft.	1. 0 ea.
* *	*	*	*	*	*
Cord CX–56/TIQ–2	2			25 ft.	0. 875 ea.
Cord CD–605	**1**			**6.5 ft.**	**0.5**

* * * * * * *

b. Running Spares (fig. 2). The following running spares are contained in Case CY–38/TIQ–2 (marked SPARE PARTS) **(spares are contained in Case CY37A/TIQ–2 of the AN/TIQ–2A)**:

* * * * * * *

Figure 2. Spare parts, accessories and two Microphones M–2/U.

Figure 4. Amplifier AM–20/TIQ–2, top view of chassis. ***(Amplifier AM–20A/TIQ–2 is similar except as noted in figure 30.)***

4. Description of Components

* * * * * * *

c. Spare Parts Case (Case CY–38/TIQ–2) (fig. 9). The spare parts * * * marked SPARE PARTS.

Note. (Added). No spare parts case is furnished with the AN/TIQ–2A.

d. Loudspeaker Case CY–37/TIQ–2 (fig. 10). This case is * * * entrance of moisture.

Note (Added). The AN/TIQ–2A loudspeaker case has approximately the same dimensions and general arrangement as that furnished with the AN/TIQ–2 except that the cover of the AN/TIQ–2A case does not hold the microphone stands, which are stored in compartments within the case. Other compartments are provided for the microphones and spare parts.

* * * * * * *

n. Loudspeaker LS–103/TIQ–2 (fig. 14).

* * * * * * *

Note. The wingbolts are peened over to prevent loss. **Loudspeakers LS–103/TIQ–2 and LS–103A/TIQ–2 are similar; however, their parts are not completely interchangeable.**

o. Headset HS–30/U (Added). Headset HS–30/U is a magnetic-type, miniature headset consisting of two receiver units of 125-ohms impedance each. The bakelite receiver units are connected together with Headband HB–30 consisting of parkerized spring steel designed to fit the contour of the head. Cord CD–605 extends the headset cord 6½ feet and also matches the low impedance of the headset to the high impedance of the amplifier through the use of the self-contained transformer C410.

p. Microphone Stand MT–596/U (Added). This stand is a chromium-plated brass, telescopic, four-section stand, adjustable from 26¼ inches to 78 inches in height. The tripod legs are provided with rubber tips. Microphone Stand MT–596/U is three-fourths inch shorter than the commercial stand furnished with the AN/TIQ–2.

Figure 6. Turntable MX–39/TIQ–2, front view. ***(Turntable MX–39/TIQ–2 furnished with the AN/TIQ–2A does not have motor switch.)***

Figure 8. Turntable MX–39/TIQ–2, bottom view of chassis. ***(Motor switch, thermostat, and heater unit are not included with Turntable MX–39/TIQ–2 furnished with the AN/TIQ–2A.)***

Figure 9. Case CY–38/TIQ–2 (spare parts case) ***(not furnished with the AN/TIQ–2A).***

Figure 10. Case CY–37/TIQ–2 (loudspeaker case). ***(Case CY–37A/TIQ–2 is similar except as noted in paragraph 4d.)***

6. Installation

* * * * * * *

b. **On the AN/TIQ–2 only,** remove the front cover from Case CY–38/TIQ–2 (marked SPARE PARTS) by loosening the four catch fasteners. Set the spare-parts case on top of Case CY–37/TIQ–2.

Note (Superseded). Use Case CY–37/TIQ–2 or CY–37A/TIQ–2 as the bottom case.

c. Remove the front * * * four catch fasteners. **On the AN/TIQ–2, place** this case on top of the spare parts case and fasten the two together with the two catches located on each side of the case. **On the AN/TIQ–2A, place this case directly on Case CY–37A/TIQ–2.**

* * * * * * *

9. Turntable Controls (fig. 6)

a. 115–OFF–230 Switch. Switch 115–OFF–230 is * * * the 115-volt position. **The AN/TIQ-2A is identical except that the heater is not furnished and the 115-OFF-230 switch is also the motor switch.**

b. Motor Switch. The MOTOR switch * * * or 230-volt position. **The MOTOR switch is not furnished with the AN/TIQ-2A.**

Section IV. OPERATION

Note.—Before connecting Public * * * respective screw caps. **Screw-cap insulators must be in place.**

10. Starting Procedure

* * * * * * *

c. Turntable MX–39/TIQ–2.

* * * * * * *

(3) Throw MOTOR switch toggle to ON (**AN/TIQ-2 only**).

* * * * * * *

11. Operating Procedure

* * * * * * *

b. Playing Recordings. (1) Place desired record on withdrawn turntable, throw POWER switch marked 115-OFF-230 to 115 (or 230 if the line voltage is 230 volts) and, **on the AN/TIQ-2 only,** throw MOTOR switch to ON.

* * * * * * *

12. Shut-down Procedure

a. (Superseded.) Throw switches to OFF. (See note below.)

* * * * * * *

Note (**AN/TIQ–2 only**). If operation of * * * the power source.

14. Equipment Performance Check List

* * * * * * *

b. Playing Recordings.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
OPERATION	6	115-OFF-230 switch.	Throw to 115 or 230 (par. 10).	Turntable should rotate (AN/TIQ–2A only).	
	7	MOTOR switch (AN/TIQ–2 only.	Throw to ON.	Turntable should rotate.	Check fuse F101. Check power cord and connector.
	8	Speed controls (fig. 6).	Set to desired speed.		
*	*	*	*	*	*

* * * * * * *

37. Lubricating Turntable Motor

* * * * * * *

Note. If inspection indicates need for **additional** lubrication of the phonomotor, refer to paragraph 60.

39. Weatherproofing of Equipment

* * * * * * *

c. Cold-Weather Operation. Public Address Set AN/TIQ–2 is designed to operate in low temperatures. Additional warm-up time * * * cold-weather operation data. **The AN/TIQ–2A and the AN/TIQ–2 (modified) do not contain heating elements.**

41. Radio Receiver R–100/URR (fig. 18)

a. Description. Radio Receiver **R–100/URR** is an eight-tube, three-band, a-c, d-c, and battery receiver housed in a metal case. One band covers * * * cabinet rear plate.

* * * * * * *

Figure 21: Connect the high side of C19 to the high side of C18. Transpose red and green blower motor wire designations. Insert corrected voltage and resistance values (fig. 23).

Figure 21. Amplifier AM–20/TIQ–2, schematic diagram. ***(Amplifier AM–20A/TIQ–2 is similar except for an added 600-ohm winding on transformer T1 secondary. Refer to figure 23 for AM–20A/TIQ–2 voltage and resistance values.)***

47. Turntable MX–/TIQ–2 (figs. 6, 7, and 8)

* * * * * * *

b. Motor. The motor, used * * * single-phase, shaded-pole type. Interchangeable gears are used to change the speed of the turntable disk from 78 to 33⅓ rpm. A governor, attached * * * the governor weights.

c. Temperature Control Unit (fig. 22). A temperature control * * * and heater unit. When the temperature inside the turntable reaches 55° F., the thermostat breaks the circuit to the heater unit. The thermostat completes the heater circuit when the temperature drops to 45° F. **Removal of the temperature control from the turntable of the AN/TIQ–2 is authorized by MWO SIG 11–2586–1, 3 March 1948. The turntable included with the AN/TIQ–2A does not have a temperature control unit.**

*Figure 22. Turntable MX–39/TIQ–2, schematic diagram (**AN/TIQ–2**). (**Removal of HR101 and S101 authorized by MWO SIG 11–2586–1, 3 March 1948.**)*

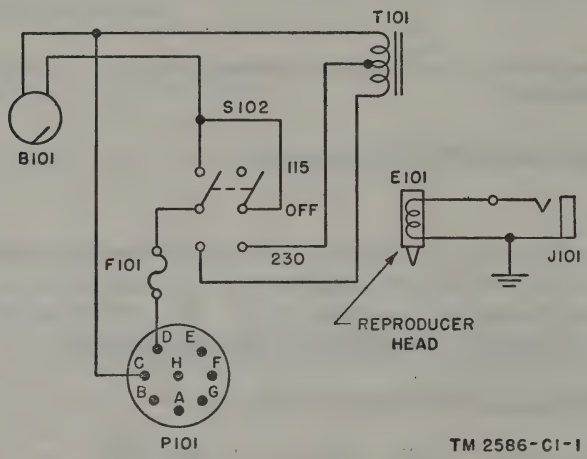
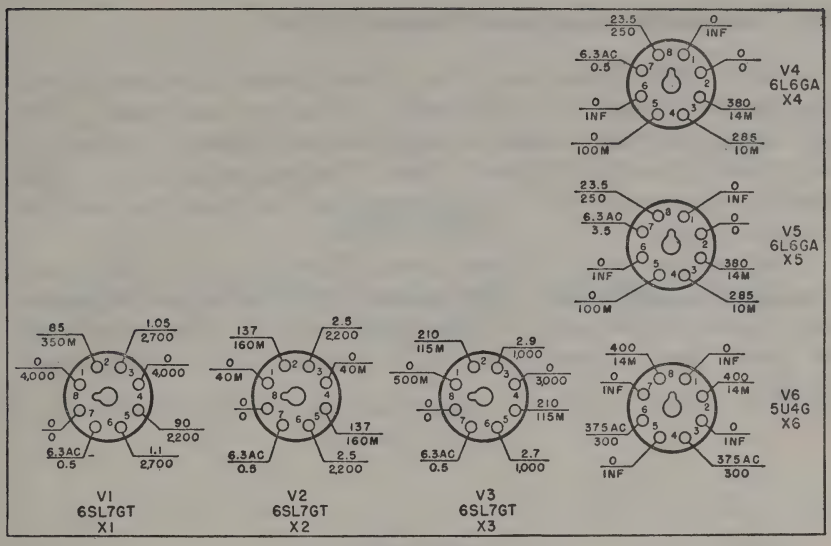


Figure 22.1. (Added.) Turntable MX–39/TIQ–2, schematic diagram (AN/TIQ–2A).



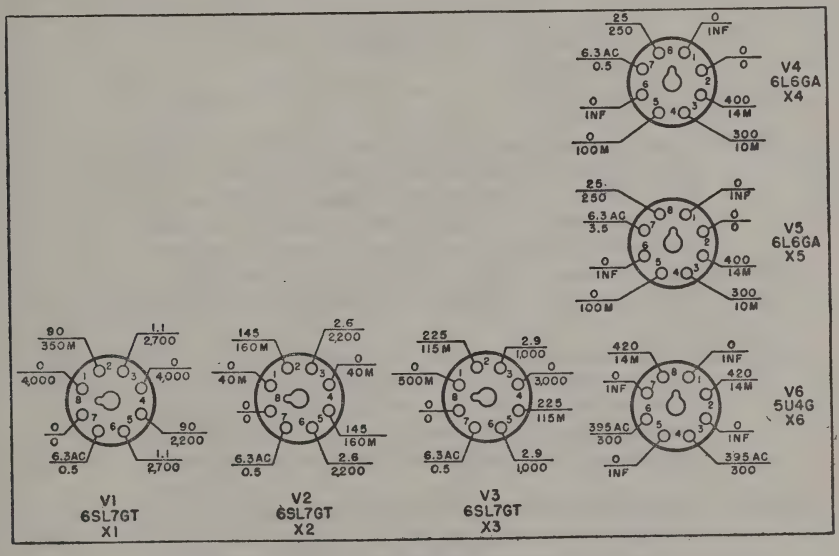


Figure 23. (*Superseded.*) *Voltage and resistance data for Amplifiers AM–20/TIQ–2 and AM–20A/TIQ–2.*

61. Unsatisfactory Equipment Report (Added)

a. WD AGO Form 468 (War Department Unsatisfactory Equipment Report) for Equipment Used by the Army. WD AGO Form 468 will be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D. C., when trouble occurs more often than is normal, as determined by qualified repair personnel.

b. AF Form 54 (Unsatisfactory Report) for Equipment Used by the Air Force. AF Form 54 will be filled out and forwarded to Commanding General, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio, in accordance with AF Regulation 15–54.

APPENDIX I

IDENTIFICATION TABLE OF REPLACEABLE PARTS

1. Identification Table of Replaceable Parts for Public Address Set AN/TIQ–2

* * * * * * *

Ref. symbol	Name of part and description	Signal Corps stock No.
	PUBLIC ADDRESS SET AN/TIQ–2	
	PUBLIC ADDRESS SET * * * Sig C spec #271–3023.	6C200–2
	PUBLIC ADDRESS SET AN/TIQ–2A: power output rating 20 w; portable; input 115 or 230 v, 60 cyc, single ph, 200 w; includes record player for 10″, 12″, and 16″ records at 33⅓ rpm or 78 rpm; over-all dimen 36″ lg x 20″ wd x 40″ h; Sig C spec #271–3023.	**6C200–2A**
	AMPLIFIER AM–20/TIQ–2 (see par. **2, appendix I**).	2C449–20
	TURNTABLE MX–39/TIQ–2 (see par. **3, appendix I**).	6C450–2
*	* * * * * *	*
LS1 LS2	SPEAKER, dynamic: Army-Navy Loudspeaker LS–103/TIQ–2 **or LS–103A/TIQ–2;** diaphragm type, PM; output 20 w normal, 25 w peak; voice coil impedance 15 ohms; 25″ lg x 19″ diam over-all; output transformer tapped for 250, 500, 1,000 or 2,500 ohms impedance.	6C42–103
A203 A204	STAND, microphone: **Army-Navy Microphone Stand MT–596/U;** telescoping; 4 sect folding tripod base; steel; folded 21½″ lg x 2¼″ diam over-all; Eastern Mike #EE–74.	2B2193–2
*	* * * * *	*

2. Identification Table of Replaceable Parts for Amplifier AM–20/TIQ–2

Ref. symbol	Name of part and description	Signal Corps stock No.
	AMPLIFIER AM–20/TIQ–2	
	AMPLIFIER AM–20/TIQ–2: 20 w output; * * * ohms; wooden case.	2C449–20
	AMPLIFIER AM–20A/TIQ–2; 20 w output; 3db from 50 cyc to 10,000 cyc; 21½″ lg x 16″ wd x 10″ h; 115/230 v, 60 cyc, single ph; 6 input channels, 2 for 100,000 ohms high-impedance microphone, 2 for 100 ohms low-impedance dynamic microphone, one for 100 ohms impedance phone or line, one for 50,000 or 100 ohms impedance radio or carbon microphone; output impedances 600, 250, 125, 60 and 30 ohms; wooden case.	**2C449–20A**
*	* * * * *	*
C20 C21	CAPACITOR, fixed: electrolytic; 100 mf; 50 vdcw; 2¼″ lg x 1″ diam; JAN type CE31F101G.	3DB100–39
*	* * * * *	*
E3	LAMP LM–27: incandescent; 6–8 v., 0.25 amp; Mazda #44, bulb T–3–¼ clear; 1⅛″ lg over-all; miniature bayonet base; Sig C dwg **SC–D–2573**, item 3.	2Z5927
*	* * * * *	*
R4, R5, R25, R26	RESISTOR, variable (potentiometer): * * * type CS, 13–133.	2Z7272–164
*	* * * * *	*
T6	TRANSFORMER, AF: input * * * Freed #12405. **(AN/TIQ–2 only.)**	2Z9631.324
T6	TRANSFORMER, AF: input * * * Freed #12404. **(AN/TIQ–2A only.)**	2Z9631. 323
T1	TRANSFORMER, AF: plate * * * Freed #12406. **(AN/TIQ–2 only.)**	2Z9632.453
T1	**TRANSFORMER, AF: plate coupling type; test voltage 2,000 v; 26 ga TR C core; pri 9,000 ohms CT, 105 ma; secd 600 ohms tapped at 250, 125, 60, and 30 ohms, 6:1; 125 ohms; 8.45:1; 60 ohms; 12:1; 30 ohms; 16.9:1; HS; electrostatically shielded; case dimen 3⅛″ x 3⅜″ x 4¼″ h; response 100–5,000 cyc flat 2 db; 20 w; 9 ceramic ins term on bottom; 4 10–32 mtg studs 9/16″ lg on 2″ x 2½″ mtg/c; UTC #C–2081. (AN/TIQ–2A only.)**	**2Z9636.117**
T2	TRANSFORMER, power: fil * * * Freed #12401. **(AN/TIQ–2 only.)**	2Z9607–25
T2	**TRANSFORMER, power: fil and plate; input 220/110 v, 60 cyc, single ph; 3 output windings, secd #1, 385/0/385 v, 150 ma; secd #2, 5 v, 3 amp; secd #3 6.3 v, 5 amp CT; HS; 5 5/16″ lg x 4½″ h; UTC #C–2082. (AN/TIQ–2A only.)**	**2Z9608–90**
*	* * * * *	*

3. Identification Table of Replaceable Parts for Turntable MX–39/TIQ–2

Ref. symbol	Name of part and description	Signal Corps stock No.
	TURNTABLE MX–39/TIQ–2	
*	* * * * *	*
HL101	HEATING ELEMENT, electrical: * * * GE #2A65. **(Not used on the AN/TIQ–2A.)**	2Z5015–87
*	* * * * *	*
S101	SWITCH, thermostatic: SPST; * * * Spencer Thermo #C435117. **(Not used on the AN/TIQ–2A.)**	3Z9695–15
S103	SWITCH, toggle: SPST; * * * type STR01 tip. **(Not used on the AN/TIQ–2A.)**	3Z9863–42A.1
S102	SWITCH, toggle: SPDT; * * * type STR01 tip. **(AN/TIQ–2 only.)**	3Z9863–42E.1
S102	**SWITCH, toggle: SPDT, on-off-on positions; molded bakelite body; 1 21/64″ lg x 49/64″ wd x 1 1/16″ d incl term; cont cur carrying cap 30 v DC, 30 amp; 125 v AC 25 amp; bushing 15/32″–32 x 15/32″ lg; JAN type ST52P (AN/TIQ–2A only).**	2Z9621–129
*	* * * * *	*

Figure 27. ① ***Resistor** color codes.*

② ***Resistor** data.*
Figure 27.—Continued

Figure 28. ① ***Capacitor** color codes.*

② ***Capacitor** data.*
Figure 28.—Continued

Figure 30. Amplifier AM–20/TIQ–2, top view, parts identification. ***(On the AM–20A/TIQ–2, transformer T6 is higher; no shield appears behind R26; and V4, V5, and V6 have top clamps.)***

Figure 31. Amplifier AM–20/TIQ–2, bottom view, parts identification. ***(On the AM–20A/TIQ–2, T1 has an additional terminal.)***

Figure 32. Turntable MX–39/TIQ–2, front view, parts identification. ***(Switch S103 not used on AN/TIQ–2A.)***

Figure 33. Turntable MX–39/TIQ–2, bottom view, parts identification. ***(S103, S101, and HR101 are not used on AN/TIQ–2A.)***

[AG 300.7 (20 Jul 48)]

By order of the Secretary of the Army:

Official:
EDWARD F. WITSELL
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The Adjutant General

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Distribution:

Army:

Tech Sv (2); Arm & Sv Bd (1); AFF Bd (ea Sv Test Sec) (1); AFF (5); OS Maj Comd (5); Base Comd (3); MDW (5); A (ZI) (20), (Overseas) (5); CHQ (2); FC (2); USMA (2); Sch 11 (10); Gen Dep 11 (10); Dep 11 (5) except Baltimore & Sacramento (20); Tng Ctr (2); PE (10); Lab 11 (2); 4th & 5th Ech Maint Shops 11 (2); T/O & E 5–76 (2); 5–416 (2); 5–510–1T (2); 7–2–OS (2); 7–12–OS (2); 7–32T (2); 7–52T (2); 11–47 (2); 11–107 (2); 11–127 (2); 11–147S (2); 11–587 (2); 11–592 (2); 11–597 (2); SPECIAL DISTRIBUTION.

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USAF (5); USAF Maj Comd (5); USAF Sub Comd (3); Services (MATS) (2); Class III Instls (2); T/O & E 1–182T (2); SPECIAL DISTRIBUTION.

For explanation of distribution formula, see TM 38–405.

AGO 253B
U. S. GOVERNMENT PRINTING OFFICE: 1948

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ADDENDA

6 MAY 1952

ADDENDA TO SUPPLEMENT TO

TM 11–2586

PUBLIC ADDRESS SETS AN/TIQ-2 AND AN/TIQ-2A

The following information, published on Order Nos. 6245–Phila–51, 6246–Phila–51, 6247–Phila–51, and 21480–Phila–50, modifies the Supplement to TM 11–2586, 5 October 1951. The information covered by these addenda applies only to Amplifier AM–20B/TIQ–2, which has been modified during production, and which is thus identified by the appearance of the letter "M" located directly below the nameplate on the amplifier panel. The equipment covered in these addenda is:

PUBLIC ADDRESS SETS AN/TIQ-2B

Personnel using this equipment and having custody of this technical manual will enter suitable notations beside each affected paragraph and figure in the technical manual to indicate the presence of this supplementary information.

Note. Amplifier AM–20B/TIQ–2, modified (figure 3.1) is similar to amplifier AM–20B/TIQ–2 except for the following:

1. Switch S1 has been changed to a DPDT switch so this switch also breaks the voltage to the carbon microphone when the switch is in the RADIO position.
2. A one ampere fuse (F2) has been added for 230 v operation.
3. Fuse F1 for 115 v operation has been changed from 5 amperes to 2 amperes.
4. Capacitors C20 and C21 have been changed to a new rating of 90 mf, 100 v.

Page 3. Par. 3. In subparagraph b, add the following at the end of the table:

Quantity	Part
5 ea	Fuse, F2

Page 5. Fig. 3. Insert figure 3. 1 after figure 3.

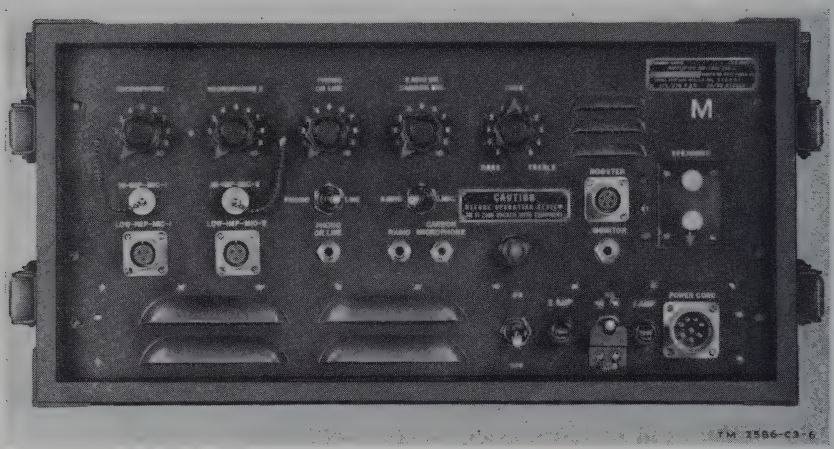


Figure 3.1. Amplifier AM–20B/TIQ–2 (modified), front panel.

Page 20. Par. 8. In subparagraph e, add the following after the second sentence:

(In the modified amplifier, switch S1 (when in RADIO position), also disconnects the voltage to the carbon microphone.

Page 25. Par. 14. Add the following for item number 3, in the column headed "Corrective Measures":

If equipment is operating from a 230 volt power source, check fuse F2 as well as fuse F1.

Page 42. Fig. 21. Insert figure 21.3 after figure 2.1.2.

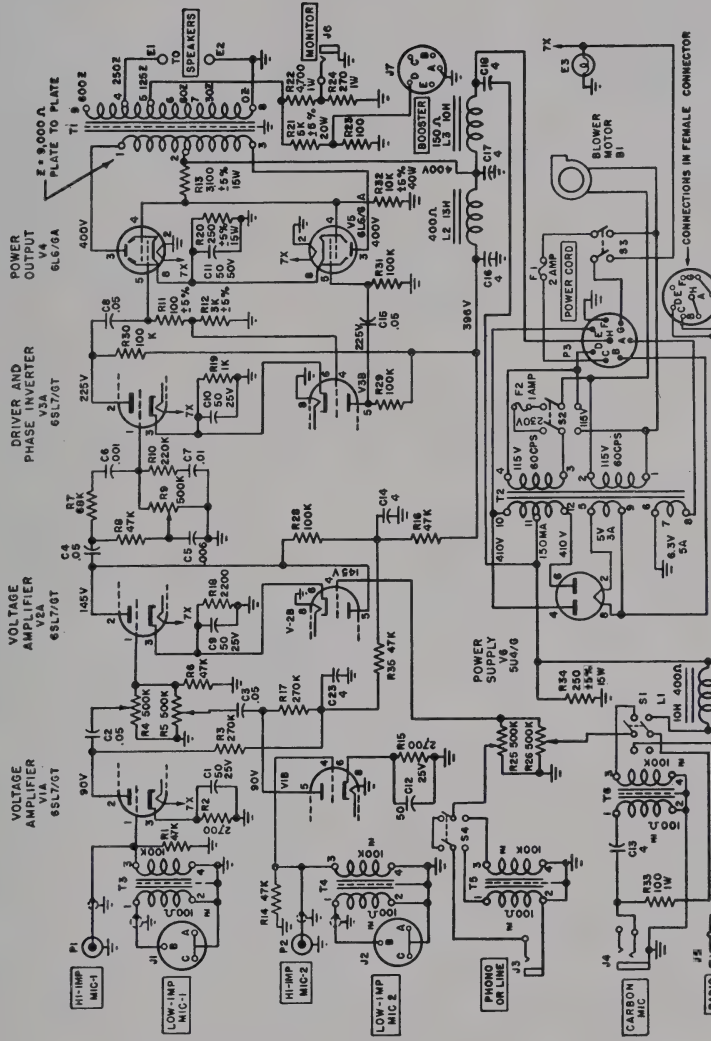


Figure 21.3. Amplifier AM–20B/TIQ–2 (modified), schematic diagram.

Page 48. Par. 45. In subparagraph c, add the following at the end: (In all modified amplifiers, C20 and C21 are 90 mf each.)

Page 57 Par. 57. Make the following additions to the chart in subparagraph b:

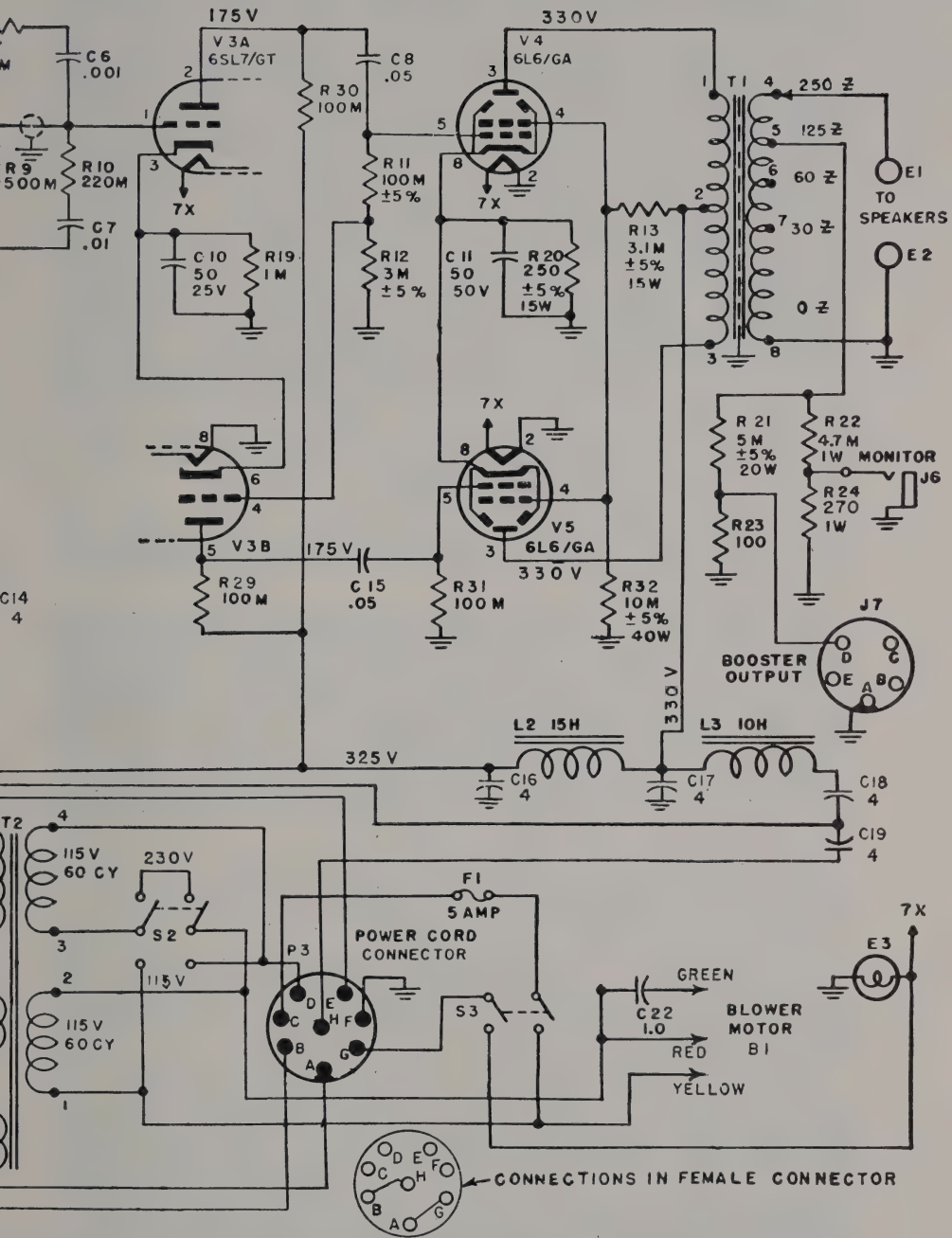
In the column headed "Symptom" add the following at the end of item 4: (In the modified amplifier, check fuse F2 also).

In the column headed "Probable Cause" in item 6 add the following after "Fuse F1 open": (In the modified amplifier, fuse F2 may be open.)

In the column headed "Correction" in item 6, add the following after "Replace fuse F1": (In the modified amplifier fuse F2 may need replacement.)

Note. The following parts, plus the parts listed in Appendix 1.1 of the supplement (5 October 1951) (except for C20, C21, F1 and S1), comprise an identification table of parts for Public Address Set AN/TIQ–2B (modified).

Ref symbol	Name of part and description	Function of part	Signal Corps Stock No.
C20, C21	CAPACITOR, fixed: electrolytic 90 uf, 100 vdcw.	Filter microphone current.	
F1	FUSE, cartridge: 2 amp at 250 v; one time.	Protective device.	3Z1927
F2	FUSE, cartridge: 1 amp at 250 v; one time; FU–26.	Protective device.	3Z1926
S1	SWITCH, toggle: DPDT; JAN type ST22N w/JAN type STRO1 tip.	To switch in radio or carbon microphone.	3Z9863–52N.1
E5	FUSEHOLDER, extractor post type; for one #3 AG cartridge fuse. 8 amp, 125 v.	Fuseholder for F2.	3Z1939



ANCES IN OHMS 1/2 W ± 10%, UNLESS OTHERWISE SHOWN , W = WATT , M = 1000 OHMS

PACITOR VALUES IN MICROFARADS AND 600 V, UNLESS OTHERWISE SHOWN.

TL 90638-S

Q-2, schematic diagram.

(2) Remove the 12 screws from the rear plate of the radio cabinet.

(3) Pull the antenna wire through the rear plate and disconnect battery lead from the batteries (if used). Pull the radio chassis out of the cabinet about 3 inches and locate the speaker plug. Pull out the speaker plug and lift it out of the way.

(4) Pull the radio completely out of the cabinet and place it in an upsidedown position to expose the bottom.

(5) Prepare a two-conductor, insulated cord of suitable length by removing ¼ inch of insulation from one end. Tin the bare conductors. Locate one of the two oblong holes in the chassis next to the rectifier tube (Tube JAN–25Z6GT/G) and insert the tinned end of the two-conductor cord through this hole. Pull through enough wire to reach about 1½ inches beyond the terminals on top of the volume control. (See fig. 19.) Tie a knot in the cord at the hole to prevent strain on the volume control terminal (when connection is made).

(6) Solder one conductor to a ground lug on the chassis (fig. 19) and the other conductor to the center terminal of the volume-control potentiometer.

(7) Check for pieces of dropped solder and wires pushed from their normal positions. Install the radio set near its cabinet and connect the speaker plug. Operate the set in its upside-down position and let it play while a Plug PL–55 is being installed at the other end of the two-conductor cord.

Note. Be sure to connect the grounded lead of the two-conductor cord to the sleeve terminal of the plug. If the grounded lead is connected to the plug tip, the audio signal will be grounded out.

(8) Insert Plug PL–55 into the RADIO jack of the public address set and turn on the public address set. (See par. 11.)

(9) After operating the equipment a few minutes to insure that everything is in working order, turn off the current and reinstall the radio set into its cabinet. Install the rear panel and bring the two-conductor cord through the small door. Leave the door partly open.

f. Operation of Radio Set. To avoid the possibility of introducing a distorted signal into the public address set, carefully tune the radio receiver to the desired station. Adjust the volume control to keep the audio signal at a relatively low strength; keep it in that position. Further volume adjustment should be made with the public address set volume control. The speaker of Radio Receiver R–100/URR may be silenced by inserting an open-circuited Plug PL–55 into the jack marked OUTPUT on the radio set panel. (See fig. 18.)

Note. It may be desirable to remove the input plug from the panel of the public address set (RADIO jack) while tuning the radio set. After the desired station is received and the volume is adjusted, the plug may be reinserted into the RADIO jack of the public address set panel.

g. SERVICING RADIO RECEIVER R–100/URR. Resistance and voltage measurements, alinement data, battery installation information, and a schematic diagram may be found in Changes No. 6, TM 11–310. A complete list of parts and their values in addition to alinement data, battery installation data, schematic diagram, alinement instructions, and installation information may be found on the inside of the rear cover of the radio set cabinet and on the shelf which supports the radio receiver chassis. Operating instructions may be made available by opening the small door at the rear of the cabinet. See TM 11–310 for pertinent information covering the general servicing of radio sets.

Section XII. POWER UNIT PE–214–A

42. Use of Power Unit PE–214–A With Public Address Set AN/TIQ–2

Power Unit PE–214–A is a compact, lightweight, gasoline-engine-driven generator capable of generating 120 or 240 volts, 60-cycle, single-phase, alternating current. The generator windings are brought out to terminal leads which can be arranged for 120- or 240-volt operation. A twist-lock receptacle and binding posts are furnished on the end of the generator housing. For a complete description of the procedure for making proper connections, see TM 11–913.

Section XIII. VIBRATOR PACK PP–31( )/TIQ–2

43. Vibrator Pack PP–31( )/TIQ–2

Public Address Set AN/TIQ–2 is designed to operate from a 6- or 12-volt, d-c source as well as from a 115- and 230-volt, a-c line. For operation from direct current, Public Address Set AN/TIQ–2 must be used with Vibrator Pack PP–31( )/TIQ–2. For complete information regarding the installation, operation, and maintenance of Vibrator Pack PP–31( )/TIQ–2, see TM 11–2596 (when published).

Note. Jumper wire connections between pin F and ground on connector plug P3 (on Amplifier AM–20/TIQ–2 (Public Address Set AN/TIQ–2)) must be installed on public address sets bearing serial numbers 1 to 25, inclusive, when sets with these serial numbers are used with Vibrator Pack PP–31( )/TIQ–2.

PART FIVE
REPAIR INSTRUCTIONS

Section XIV. THEORY OF EQUIPMENT

44. Amplifier AM–20/TIQ–2 (Figs. 20 and 21)

a. General. (1) Amplifier AM–20/TIQ–2 is a six-tube amplifier using three dual-triode tubes (V1, V2, and V3) in the first, second, and driver-inverter stages respectively. The output tubes (V4 and V5) are beam-power amplifiers using a smaller glass envelope than the usual type. They are designated as Tubes JAN–6L6/GA; the dual-triode tubes mentioned above are Tubes JAN–6SL7. The rectifier tube is Tube JAN–5U4/G.

(2) In the discussion which follows, each stage of the amplifier is covered separately. (See figs. 20 and 21.)

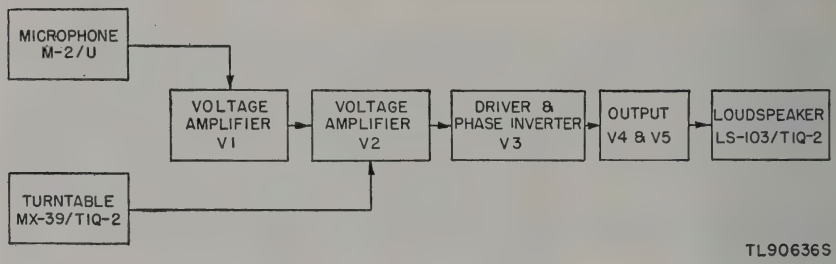


Figure 20. Block diagram of Public Address Set AN/TIQ–2.

b. Voltage Amplifier Stage Using Tube JAN–6SL7GT (V1). (1) Tube JAN–6SL7GT (V1) is the initial dual-triode amplifier tube for the low-impedance and high-impedance microphone channels. A signal from a high-impedance microphone is introduced into the amplifier through either jack P1 or P2. (P1 is connected directly to the control grid of V1A; P2 to the control grid of V1B.) The signal is amplified in both halves of the tube (V1) and coupled through capacitors C2 and C3 to MICROPHONE 1, control R4, and to MICROPHONE 2, control R5. These 500M-ohm potentiometers (R4 and R5) control the amount of signal applied to the control grid of one half of the following amplifier tube (V2A).

(2) A signal from a low-impedance microphone is introduced at J1 or J2, which are wired across the primaries of input transformers T3 and T4 respectively. These transformers step up the

audio voltage and also present the proper impedance to V1. The induced voltage across the secondary of either T3 or T4 is fed directly to the control grids of V1A and V1B where the action is similar to that described above (for high-impedance microphone).

c. Voltage Amplifier Stage Using Tube JAN–6SL7GT (V2). (1) Tube JAN–6SL7GT (V2) is the *second* dual-triode amplifier for a signal originating in a crystal or dynamic-type microphone, and the *first* amplifier tube for a signal originating in Turntable MX–39/TIQ–2, in a carbon microphone, or in a radio receiver. Tube V2 permits the signals from two or more of the various channels described above to be mixed. A signal from the turntable unit or from a carbon microphone is introduced at J3 or J4, stepped up in transformer T5 or T6, and fed to volume control R25 (PHONO OR LINE) or R26 (RADIO OR CARBON MIC) respectively. Potentiometers R25 and R26 control the amount of signal voltage fed to the control gird of V2B.

(2) A signal from a radio is introduced at J5 and fed through switch S1 (RADIO C MIC) to volume control R26 (RADIO OR CARBON MIC). From this point the action is similar to that already described.

d. Driver and Phase-inverter Stage Using Tube JAN–6SL7 (V3). Tube JAN–6SL7 (V3) is a two-section amplifier. The first section (triode), or *driver,* amplifies the audio voltages from V2, and this audio voltage is coupled to the control grid of output tube V4 (Tube JAN–6L6/GA) through capacitor C8. The voltage at this grid is tapped off (voltage divider R11 and R12) and fed to the control grid of the second section, or *phase-inverter section,* of the tube (V3B). This audio voltage is amplified by the phase-inverter and coupled to the control grid of output tube V5 through capacitor C17. Since the audio voltage at the control grid of V4 is 180° out of phase with the audio voltage at the control grid of the driver (V3A), there is a 180° phase difference between the two control grids of V3, and also between the control grids of V4 and V5. Resistors R11 and R12 have values such that the signal voltages at the grids of V4 and V5 are of equal amplitude.

e. Output Stage Using V4 and V5 (Tube JAN–6L6/GA). The output tubes V4 and V5 receive the input audio voltages from V3. The audio power signal is then coupled to the speaker line by output transformer T1, the primary of which offers the correct load impedance to the output tubes. Because the output tubes have 180° phase difference, a large part of the amplification occurs in the tube which is instantaneously operating (with lower distortion). Consequently the *push-pull* arrangement allows for a minimum of distortion at a given output.

45. Power Supply of Amplifier AM–20/TIQ–2

a. A-c voltage from an external source is conducted through Cord CX–49/TIQ–2 (W201), Cord CX–53/TIQ–2 (W203), Cord CX–54/TIQ–2 (W204), and Cord CX–55/TIQ–2 (W205) to receptacle P3 on the front panel of Amplifier AM–20/TIQ–2. From this receptacle, the a-c voltage passes through fuse F1 (which protects the amplifier against internal shorts and overloads) to one side of switch S3 (ON-OFF) amplifier on the panel. When switch S3 is thrown to ON, and switch S2 is in its proper voltage-selection position, a-c voltage is applied to the two primary windings of transformer T2. For 115-volt operation, the two primary windings are connected in parallel. For 230-volt operation, the two primary windings are connected in series.

b. Transformer T2 has three secondary windings. A 6.3-volt secondary steps the a-c line voltage down to 6.3 volts for the filaments of tubes V1, V2, V3, V4, and V5 and for pilot lamp E3. A high-voltage winding, which steps up the a-c line voltage, is connected to the plates of rectifier tube V6. This tube rectifies the high a-c voltage and delivers a pulsating d-c voltage through receptacle P3 to filter capacitors C16, C17, C18, and C19, which, in combination with filter chokes L2 and L3, smooth out the fluctuations in the d-c voltage output. A second low-voltage winding steps down the a-c line voltage to 5 volts for the filament of V6. Receptacle P3 may be used with appropriate adapters and circuit modifications to permit operation of the amplifier from an auxiliary source of d-c power. (See par. 43). In an emergency, the filaments of the vacuum tubes may be supplied by an external source of 6 volts alternating current or direct current. High B voltage may be obtained for the set from an external source and fed through the filter circuit to the amplifier tubes.

c. Current to operate a carbon microphone is obtained from the power supply by utilizing the voltage drop across resistor R34 which is connected in series with the low side of the B supply. Plate current for the five amplifier tubes flows through R34, and sufficient voltage appears across this resistor to operate the carbon microphone. R33 limits the microphone-button current to a safe value. Two 100-mf capacitors bypassing a 10-henry choke serves to filter the microphone current of undesirable hum.

46. Loudspeaker LS–103/TIQ–2 (Fig. 14)

The speaker converts the audio-frequency output of Amplifier AM–20/TIQ–2 into sound and projects this sound as desired. The loudspeaker cables (field wire) conduct the audio output from the speaker binding posts on the front panel of the amplifier

to the binding posts on the speaker terminal board. Transformer T201 on Loudspeaker LS–103/TIQ–2 is provided with various impedance connections which may be selected to match the output of the amplifier. These taps are labeled 0, 250, 500, 1,000, and 2,500 ohms. The voice coil is located in a steady magnetic field produced by a permanent magnet. When energized with the audio output voltage from the amplifier, the voice coil vibrates in accordance with the audio frequency. The voice coil is attached to a diaphragm which vibrates and produces sound. The reflex horn of Loudspeaker LS–103/TIQ–2 couples this diaphragm efficiently with the surrounding air.

47. Turntable MX–39/TIQ–2 (Figs. 6, 7, and 8)

a. Reproducer Head. The reproducer head consists of a permanent magnet, a coil, and a movable core (armature) with an attached needle. A fluctuating voltage is generated in the coil when the magnetic field is disturbed by movement of the movable core. This core, securely attached to the needle, is caused to vibrate because of the variations in the grooves of the recording in which the needle rides.

b. Motor. The motor, used to drive the turntable disk, is of the standard, single-phase, shaded-pole type. Interchangeable gears are used to change the speed of the turntable disk from 7/8 to 33-1/3 rpm. A governor, attached to the shaft of the armature, maintains the motor at a fairly constant speed. Speed is regulated by the speed control, which extends or narrows the movement of the governor weights.

c. Temperature Control Unit (Fig. 22). A temperature control unit is mounted on the inside of the turntable chassis. Its function is to prevent the motor grease from hardening excessively. When connected to the power source, the temperature control unit maintains an almost constant ambient temperature by means of a thermostat and heater unit. When the temperature inside the turntable reaches 40°F, the thermostat breaks the circuit to the heater unit. The thermostat completes the heater circuit when the temperature drops to 30°F.

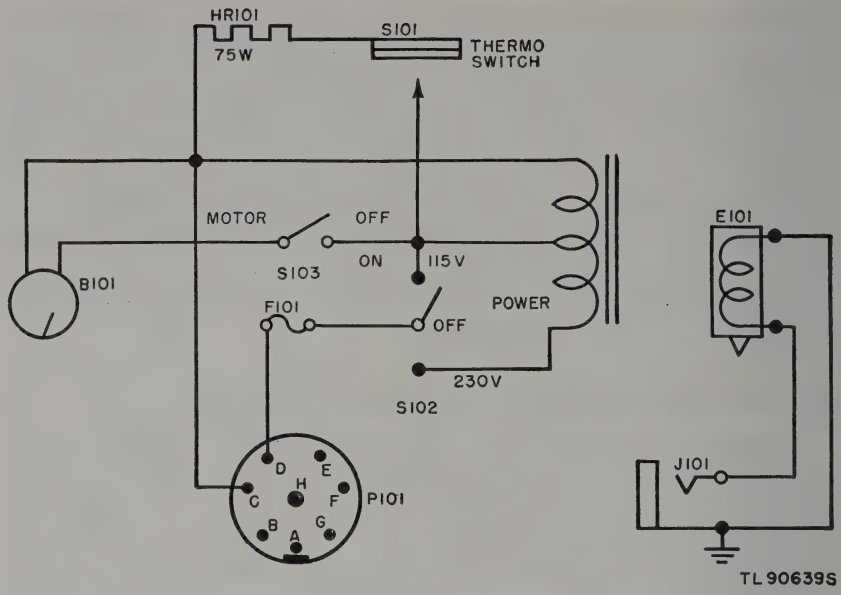


Figure 22. Turntable MX–39/TIQ–2, schematic diagram.

Section XV. TROUBLE SHOOTING

48. Introduction

No matter how well equipment is designed and manufactured, faults occur in service. When such faults occur, the repairman must locate and correct them as rapidly as possible. This section contains information designed to aid those engaged in the important duty of trouble shooting.

a. TROUBLE-SHOOTING DATA. The following material will help the repairman locate the trouble more quickly.

(1) Illustrations showing the location of parts and their reference symbols. (See figs. 29 to 33, incl.)

(2) Diagrams (figs. 16, 20, 21, and 22). Voltage and resistance data (fig. 23).

(3) The symptoms, probable causes, and remedies given in the trouble-shooting chart. (See par. 57.)

b. TROUBLE-SHOOTING STEPS. The first step in servicing the public address set is to sectionalize the trouble (if possible) through inspection. *Sectionalization* means tracing the fault to the component responsible for the trouble. The second step is to localize the fault. *Localization* means tracing the fault to the defective part in the component suspected of being responsible for the trouble.

49. Trouble Shooting by Inspection

Before starting an elaborate test procedure, attempt to locate the cause of the trouble by inspecting the amplifier, cords, cables, and speakers. Turn off the power and check immediately so that odors, abnormal signs (which may disappear upon cooling off), and other temporary indications may be readily detected. Look for the following:

a. Overheated Parts. Excessive heat may cause oil to drip from the paper capacitors. Check for a nearby resistor or any part showing signs of excessive heating. Metal parts will usually discolor; resistors will also change in color if subjected to the passage of excessive current over a long period of time. Look for burned insulation on the hook-up wires. The acrid odor of burning insulation or enamel used to insulate the blower or phono motor windings may lead the trouble shooter to the defective part. Smoke rising from any part may indicate the presence of a short circuit, usually between high-voltage wires and ground (B—) in the power supply of the amplifier.

b. Mechanical Faults. Mechanical faults usually reveal themselves through noise other than the usual noises heard during normal operation. If the offending part is not immediately indicated, stop the set and start again. Listen carefully to the sounds coming from each moving part. Consult the normal indication column in the equipment performance check list. (See par. 14.)

(1) The noise resulting from loosened parts-mountings may sometimes be tracked down by feeling the suspected parts. Pressing down on a suspected part may stop the vibration and eliminate the sounds. This type of trouble is not likely to occur if the tightening operations are applied as scheduled in the preventive maintenance check list. (See par. 32.)

(2) Connectors, cables, knobs, switches, terminals, and other parts which are subjected to mechanical wear and tear usually reveal their condition upon examination. If any of the above parts are suspected, examine them for loose screws, mountings, corrosion, etc. A loose connection between the microphone and amplifier results in erratic operation of the entire public address set.

c. Summary. An experienced trouble shooter will always inspect the equipment for visible signs of trouble. The majority of troubles in public address sets usually result from defective tubes, defective needles, or poor connections into the several input circuits of the amplifier. Loose cable clamps or set-screws, corrosion at critical points, poorly soldered joints, and many other

similar visible defects can usually be seen or felt during inspection. The use of test equipment may not be necessary when making such an inspection. Familiarity with the normal signs, conditions, sounds, smells, etc., help the trouble shooter. Study the diagrams (figs. 20, 21, and 22) and know the location of the parts by using the illustrations (figs. 29 to 33, incl.) and the reference symbols thereon. Learn to trouble shoot by inspection and use the test equipment to confirm the findings if necessary.

50. Voltage Measurements

a. GENERAL. Voltage measurements aid the repairman because many troubles either result from abnormal voltages or produce abnormal voltages. Voltage measurements are made between two points in a circuit; the circuit need not be interrupted.

(1) Operating voltages are given in figure 23. These voltages are measured between the indicated socket points and ground.

(2) Set the voltmeter on the highest range so that the voltmeter will not be overloaded. Then, if it is necessary to obtain increased pointer deflection, set the voltmeter to a lower range.

b. PRECAUTIONS AGAINST HIGH VOLTAGE. Certain precautions must be taken when measuring voltage above a few hundred volts. High voltages are dangerous and under certain conditions can be fatal. When it is necessary to measure high voltages, observe the following rules:

(1) Connect the voltmeter B— lead to B— (or ground) and make the connection secure.

(2) Connect the voltmeter B+ test lead to the hot terminal. Do not touch the metal prod of the voltmeter lead.

c. VOLTMETER LOADING. It is essential that the voltmeter resistance be at least 10 times greater than the resistance of the circuit under measurement. If the voltmeter resistance is comparable to the circuit resistance, the voltmeter will indicate a lower voltage than the actual circuit voltage present with the voltmeter load removed from the circuit.

(1) The resistance of the voltmeter on any range can always be calculated by the following rule: The resistance of the voltmeter equals the voltmeter ohms per volt multiplied by the full-scale range of the voltmeter in volts. Two examples are shown below:

(*a*) What is the resistance of a 1,000-ohms-per-volt voltmeter on the 300-volt range?

$$R = 1{,}000 \text{ ohms per volt} \times 300 \text{ volts} = 300{,}000 \text{ ohms.}$$

(*b*) What is the resistance of a 20,000-ohms-per-volt voltmeter on the 300-volt range?

R = 20,000 ohms per volt × 300 volts = 6 megohms (6,000,000 ohms).

(2) To minimize voltmeter loading in high-resistance circuits, use the highest voltmeter range. Although only a small deflection will be obtained (possibly only 5 divisions on a 100-division scale), the accuracy of the voltage measurement will be increased. The decreased loading of the voltmeter will more than compensate for the inaccuracy which results from reading only a small deflection on the scale of the voltmeter.

(3) When a voltmeter is loading a circuit, the effect can always be noted by comparing the voltage reading on two successive ranges. If the voltage readings on the two ranges do not agree, voltmeter loading is excessive. The reading (not the deflection) on the highest range will be greater than on the lowest range.

(4) The voltage and resistance data (fig. 23) used in this manual are based upon readings taken with a 1,000-ohms-per-volt instrument. The trouble shooter should use a meter having the same sensitivity. If the load of the meter to be used is the same as that of the meter used in previously measuring the voltage, it is not necessary to consider the effect of loading.

51. Resistance Measurements

a. Normal Resistance Values. When a fault develops in a circuit, its effect will very often be apparent as a change in the resistance values. To assist in the localization of such faults, trouble-shooting data, including normal resistance values, have been provided. The normal resistance values at any point in the circuit can be determined by referring to the resistance values shown in the schematic diagram. (See fig. 21.) Values of resistors may be determined with the resistor color code. (See fig. 28.)

b. Precautions. (1) Before making any resistance measurements, turn off the power. An ohmmeter is essentially a low-range voltmeter and battery. If the ohmmeter is connected to a circuit which already has voltages in it, the needle will be thrown off scale and the voltmeter movement may be damaged.

(2) Capacitors must always be discharged before resistance measurements are made. This is very important when checking power supplies that are disconnected from their load. The discharge of a capacitor through the meter may damage the meter movement.

c. Correct Use of Low and High Ranges. Make certain when

to use the low-resistance range and when to use the high-resistance range of an ohmmeter. When checking the circuit continuity, the ohmmeter should be set on the lowest range. If a medium or high range is used, the pointer may indicate 0 ohms, even if the resistance is as high as 500 ohms. When checking high resistances or measuring the leakage resistance of capacitors or cables, the highest range should be used. If a low range is used, the pointer will indicate *infinite* ohms, even though the actual resistance is less than a megohm.

d. Parallel Resistance Connections. (1) In a parallel circuit the total resistance is less than the lowest resistance in the circuit. Remember this when trouble shooting with the aid of a schematic diagram.

(2) When a resistance is measured and the value is found to be less than expected, study the schematic diagram carefully to be certain that there are no resistances in parallel with the one that has been measured. Before replacing a resistor because its resistance measures too low, disconnect one terminal from the circuit and measure its resistance again, to make sure that the low reading does not occur because some part of the circuit is in parallel with the resistor.

e. Tolerance Values for Resistance Measurements. Tolerance value is the normal difference that is expected between the rated value of the resistor and its actual value.

(1) Most resistors used in the circuits have a tolerance of at least 10 percent. For example, the grid resistor of a stage might have a rated value of 1 megohm. If the resistor were measured and found to have a value between 0.8 megohm and 1.2 megohms, it would be considered normal. Usually, the ordinary resistors used in circuits are not replaced unless their values are off more than 10 percent.

(2) The tolerance values for transformer windings are generally between 1 and 5 percent. As a rule, suspect a transformer which shows a resistance deviating more than 5 per cent from its rated value. Allow the transformer to cool off before the resistance test is made.

52. Capacitor Checks

a. Capacitor Defects. It is often necessary and desirable to check capacitors for leakage and open or shorted circuits. Although open circuits sometimes occur in paper-type capacitors, because of the metal tab (terminal) pulling away from the tinfoil plates, this trouble is unusual. The usual trouble in capacitors is a short circuit or leakage caused by the break-down of the dielectric between the plates.

b. OPEN CAPACITOR. A capacitor suspected of being open can best be checked by shunting a good capacitor across it. In audio-frequency circuits (such as exist in the amplifier), the test capacitor leads may be several inches long without materially affecting the operation of the circuit of which the capacitor is a part.

c. KICK INDICATION. Any good high-resistance voltohmmeter may be used to check for leakage in a paper or mica capacitor. Tests for an open and short circuit may be made with the same instrument. (Test Unit I–176 is generally available in the field and is recommended for checking capacitors, using the kick-indication method.) The ohmmeter circuit of the test unit is used to make the check. Proceed as follows:

(1) Disconnect one end of the capacitor from its shunting circuit.

(2) Set the ohmmeter to read on its highest range and place the ohmmeter leads across the capacitor.

(3) A good capacitor should cause the meter needle to kick up the scale and fall back to infinity (zero).

(4) A leaky capacitor will cause the pointer to remain at some point on the scale other than infinity.

(5) An open capacitor will cause no deflection of the meter needle.

(6) The lower the capacitance, the lesser will be the degree of deflection which occurs on the ohmmeter scale. The higher the capacitance, the greater will be the deflection which appears on the ohmmeter scale (if the capacitor is normal). Usually, capacitors lower than 0.05 mf do not indicate a measurable kick. Replace defective capacitors.

d. CAPACITOR COLOR CODE. An illustration of the capacitor color code is given in figure 27.

53. Current Measurements

a. Current measurements are not ordinarily required in trouble shooting the set. However, if it is desired to measure the plate current of a tube or rectified current in the power supply, the circuit may be opened and the meter connected in series with the circuit. Observe polarity to keep the meter needle on the meter scale. *A milliammeter must always be connected in series with the circuit under check.*

b. A meter is least protected against damage when it is used to measure current; therefore, always set the current range to the highest value. Then, if necessary, decrease the range to give

a more accurate reading. Avoid working close to full-scale reading, because this increases the danger of overload.

c. Usually the current to be measured flows through a resistance which is either known or can be measured with an ohmmeter. The current flowing in the circuit can be determined by dividing the voltage drop across the resistor by its resistance value.

54. Tube Checking

The trouble shooter is mostly concerned with the emission of a vacuum tube. Hand-tapping of the tube envelope usually reveals shorted or poorly welded elements inside the tube. Such tubes, when tapped while under operation in the amplifier, usually result in scratchy noise from the speaker. Experience in tapping tube envelopes will teach the trouble shooter how to isolate the defective tube or tubes.

a. Results obtained from a tube checker are not always conclusive because the test conditions are not the same as those under which the tube actually operates in the amplifier. The final test of a tube may have to be its replacement with a tube known to be good. It is often quicker and more reliable to replace a suspected tube with a good one than to check it with the tube checker.

b. Tube checkers are usually available in the field. Technical manuals are packed with the instruments and they cover the tube-checker-panel settings for all types of tubes used in the public address set.

55. Replacing Parts

Careless replacement of parts often creates new faults. Note the following points:

a. Before a part is unsoldered, note the position of the leads. If the part has a large number of leads, tag each lead.

b. Don't damage other leads by pulling or pushing them out of the way.

c. Don't allow drops of solder to fall into the set; they may cause short circuits. It is very important to make well-soldered joints. A poorly soldered joint (cold-soldered) is one of the most difficult faults to locate.

d. Place the replaced part in the exact position occupied by the original part. A part which has the same electrical value but a different physical size may cause trouble.

e. Pay attention to proper grounding when replacing a part. Use the same ground point as in the original wiring.

56. Voltage and Resistance Values (Fig. 23)

The voltage and resistance data have been obtained with a 1,000-ohms-per-volt instrument. All readings are taken with the positive lead of the instrument connected to the socket pin indicated and the negative lead connected to the chassis. Controls may be set in any position with the exception of the PHONO OR LINE control which must be set at zero.

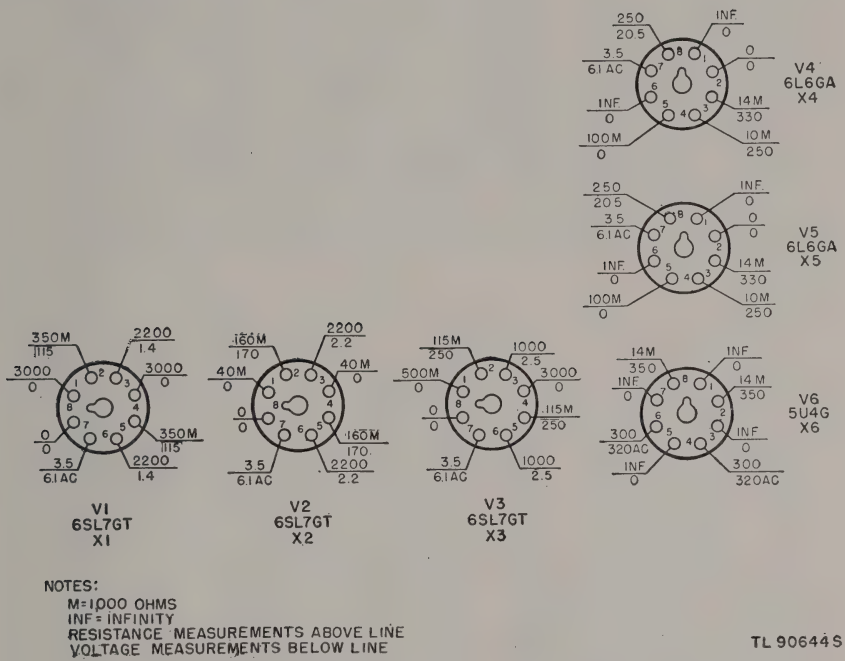


Figure 23. Voltage and resistance data for Amplifier AM–20/TIQ–2.

57. Trouble-Shooting Chart

The following trouble-shooting chart, if properly used, should facilitate trouble shooting. This chart is applicable to the turntable and amplifier. Simplified in form, the chart is primarily a guide toward locating the trouble.

a. USING CHART. Most troubles will manifest themselves by the appearance of symptoms. These symptoms appear in the first column. The second column of the chart lists the probable source of the trouble. The corrections are listed in the third column. If trouble with the equipment develops, inspect the component believed to be at fault. Look for symptoms. Inspect the first column of the trouble-shooting chart for a symptom that resembles the one found by inspection. Proceed with steps as outlined in the third column.

b. Trouble-Shooting Chart.

Symptom	Probable cause	Correction
1. Distortion.	Defective record or microphone.	Replace.
	Defective pick-up needle.	Replace.
	Weak tubes.	Replace.
	Wrong impedance match.	If one speaker is used, be sure 250 tap is used on the speaker. If two speakers are used, be sure to use the 500 tap.
	Defective phono pick-up head	Replace.
	Defective coupling capacitors.	Replace.
2. Howling from speaker.	Microphone too close or facing speaker.	Change relative positions of microphone and speaker.
	Volume control setting too high for operating conditions.	Lower the volume control setting.
3. Intermittent operation.	Poor contact in any one of the plugs.	Check for corrosion and dirt. Clean with dry-cleaning solvent (SD) and reinsert for test.
	Defective tube or tubes.	Tap each tube with a rubber eraser on a pencil. If amplifier cuts off, remove the suspected tube, replace, and retest.

Symptom	Probable cause	Correction
	Poor soldering on connections.	Look for resin connections. Resolder.
	Break in one of the interconnecting cables.	Bend cable during operation and listen for crackling noise or cut-out.
4. Frequent blowing of fuse F1.	Defective transformer T2.	Replace transformer.
	Fuse rating too low.	Replace with proper fuse.
	Defective rectifier tube V6.	Replace tube.
5. Frequent blowing of fuse F101.	Short circuit in phono motor.	Check motor for short circuit.
	Defective transformer T101.	Replace transformer.
6. Amplifier dead (panel indicator lamp	No line voltage at power receptacle.	Check line voltage.
E3 not lighted).	A-c plug loose in receptacle.	Secure by bending blades of plug.
	Fuse F1 open.	Replace fuse F1.
	Defective power transformer T2.	Replace transformer T2.
	Defective switch S3.	Replace switch.
7. Amplifier dead (panel indicator lamp E3 lighted).	Defective tubes.	Replace.
	Interconnection cord disconnected.	Check and connect.
	Open voice coil in speaker.	Repair voice coil or replace speaker.

58. Repair Procedures

Repairs to Public Address Set AN/TIQ–2 consist mainly of the following operations: making parts replacements; mending; tightening loose mountings of transformers, chokes, capacitors, and resistors; splicing and repairing defective cables and cords; straightening bent pins on connectors and plugs; removing and inserting tubes and the panel indicator lamp; tightening setscrews on all control knobs; removing corrosion from those points in the circuit which, if corroded, would interfere with normal operation (connector pins, jacks, tube socket contacts, clasps, etc.); and numerous other operations the successful execution of which results in continuous high quality equipment performance.

a. REPAIRING LOUDSPEAKER LS–103/TIQ–2. Vital parts of the loudspeaker are inclosed and are not subject to physical damage. However, the voice coil may open, dirt may lodge between the voice coil and pole pieces of the permanent magnet, or the diaphragm material may tear or distort. Distortion of the diaphragm material will result in some deterioration of tone quality and in raspiness. If trouble shooting reveals that the speaker is defective, disassemble the unit, examine it, repair or replace parts, and then reassemble it. Remove the wristwatch and keep it away from the powerful field of the permanent magnet in the driver unit.

(1) *Dissassembly of speaker.* (*a*) Remove the four retaining screws on the speaker back cover.

(*b*) Remove the back cover and expose the two wires of the voice coil.

(*c*) Unsolder one of the wires and move it away from the soldering lug.

(2) *Testing speaker driver unit.* (*a*) Using the very low resistance scale of the ohmmeter, connect the test prods across the voice coil. Normal reading should be approximately 12 ohms. (Click may be heard if speaker voice coil is normal.)

(*b*) If no click is heard or if no reading is obtained on the ohmmeter scale, the voice coil may be considered open and should be replaced.

Note. Driver units with defective diaphragms should be replaced as a complete unit. Also replace the entire unit if foreign material is lodged in the air gap (between the voice coil and pole pieces).

(*c*) Remove the defective driver unit by turning it counterclockwise until it is free of the speaker. Resolder the removed voice coil wire before turning in the unit for repairs. Observe polarity.

(3) *Testing speaker transformer T201.* (*a*) Using the lowest ohmmeter scale, connect the test prods across the transformer secondary terminals (voice coil must be disconnected). Normal reading is approximately 1.3 ohms. If there is no reading on the ohmmeter, suspect an open in the wiring outside the transformer or in the test prods before removing the transformer as defective.

(*b*) Ohmmeter readings on the primary side of transformer T201 are dependent upon the selection of the taps on the terminal board. Normal ohmmeter readings are:

Across taps	D-C resistance (ohms)
250–0	35
500–0	49
1000–0	92
2500–0	185

(4) *Testing permanent magnet.* If the defective speaker operated satisfactorily immediately before break-down, it can be safely assumed that the field magnet is strong. A reasonably strong pull on a piece of steel (screwdriver) held near the magnet is a fairly good indication of satisfactory field strength.

(5) *Reassembling loudspeaker.* After repairs or parts replacement is completed, reassemble the driver unit to the horn with the fasteners. Make sure no foreign particles adhere to the driver unit interior before snapping the fasteners in place. Mount the speaker on the tripod and tighten the wingbolt securely.

b. Repairing Amplifier AM–20/TIQ–2. Amplifier parts likely to cause trouble, and therefore to be considered for attention, are the untreated (varnish-free) tube socket contacts and potentiometer-resistor strips. When cleaning the socket contacts, avoid spreading the contact fingers excessively. A good way to clean the contacts is to pull and push the vacuum tube in the socket so that the tube pins act as a burnisher. Defective potentiometers should be replaced.

(1) *Parts replacement.* Mounting screws for chokes, transformers, sockets, capacitors, connectors, etc., are accessible and easily removed. The bracket for the blower motor, B1, is easily removed. Potentiometers are of the one-hole mounting type and, with the removal of the knob and hex nut on the shaft, may be detached from the rear of the amplifier panel. Colors of wires should be noted and identification tags attached to the free ends of wires or terminals. Always use identical replacement parts and always use the same ground lug for the ground connection. Avoid heating wires or adjacent parts with the soldering iron. Avoid dropping solder on the chassis by keeping the tip of the iron well tinned and away from the chassis when the iron is loaded with molten solder.

(2) *Placement of parts.* Parts and wires should always be reinstalled in exactly the position originally held. Cable clamps and rubber boots must be returned to their respective places and adjusted to assume former positions. All wire strands must be collected and cut off or placed alongside the main body of wire and soldered there securely.

(3) *Varnish film.* Restore the varnish film to the treated areas after repairs are completed. (See par. 38.) This operation is especially important in damp, hot climates.

59. Special Repair Procedures on Cables and Connectors

Public Address Set AN/TIQ–2 uses shielded cords and cables and when these cables are spliced or otherwise repaired, special attention must be given to the retention of the ground circuit through the braid covering. The connection of the braid to the grounded connector shell must be absolutely perfect. Equally important is the connection of the two sections of braid whenever a splice is made in a shielded conductor. Insulation underneath the broken braid must be carefully prepared to prevent jagged strands of braid from penetrating down into the conductor. After the splice is made and insulated, the ends of the braid must be electrically connected and soldered securely. Apply enough heat to make a good soldered joint. Test for cold rosin joints by gently tugging at the connection (after the solder cools). If the cable is severely damaged or damaged in several places, replace the entire cable. Always be careful when soldering the strands of shielded cable; sharp points of solder may penetrate through the insulation and short the inner conductor to the grounded shield covering.

60. Disassembly and Lubrication of Turntable Motor

The turntable motor should be lubricated through the three oil holes once monthly as described in paragraph 37. However, should the motor be disassembled for repairs, inspect the gears, wicks, and speed-control assembly for dirt and hard grease and, if necessary, clean and lubricate.

a. Disconnecting Motor from Mounting Plate. (1) Slide out the turntable unit and remove it from its wooden case. (See fig. 6.)

(2) Remove the turntable locking clip holding the turntable to the spindle (fig. 25) and lift off the turntable.

(3) Disconnect the speed control and the shifting levers. Remove the screws from the metal case. Remove the heating element.

(4) Remove the motor assembly from the mounting plate.

Remove the four screws holding the mounting brackets to the motor assembly.

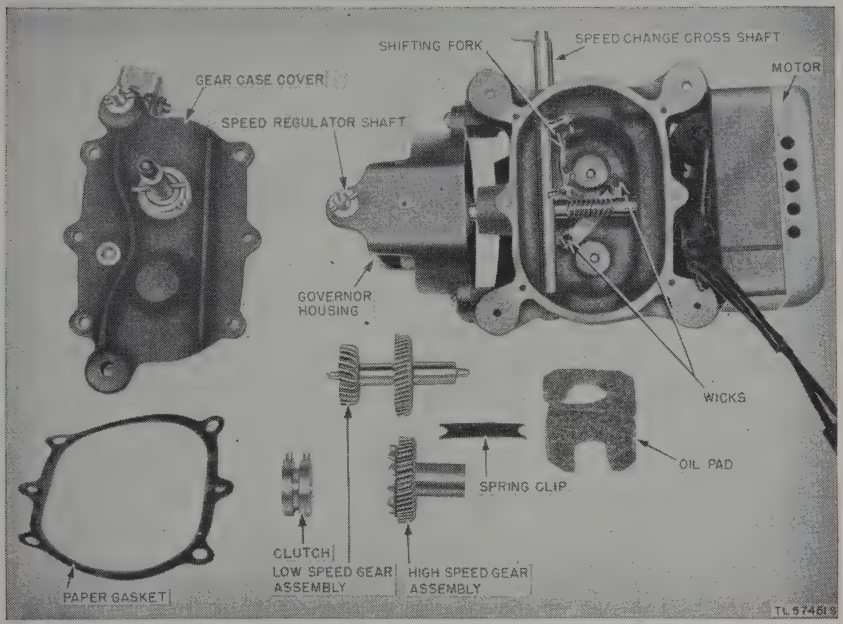


Figure 24. Phono motor parts.

b. Disassembly of Gear Case. (1) Remove the four screws from the gear-case cover and lift it off the gear case. (See fig. 24.)

Caution: Use care when removing the gear-case cover and preserve the paper gasket. (See fig. 24.)

(2) Pull out the low-speed-gear assembly (33-1/3 rpm). The low-speed gear consists of two helical gears mounted on a shaft. (See fig. 24.)

(3) Lift up the shifting fork and remove the clutch from the fork.

(4) Pull out the high-speed-gear assembly (78 rpm). The high-speed gear is a single gear mounted on a shaft. (See fig. 24.)

(5) Remove the key from the turntable-drive spindle and pull the spindle out of the hub of the reduction gear.

(6) Remove the two small screws from the collar holding the reduction gear to the top cover and lift off the collar and thin washer. (See fig. 25.) Slide the gear out of the bearing.

(7) Remove the flat steel spring holding the oil pad to the bottom of the gear case. Lift out the oil pad. Rotate the bracket holding the two wicks and remove the wicks. (See fig. 24.)

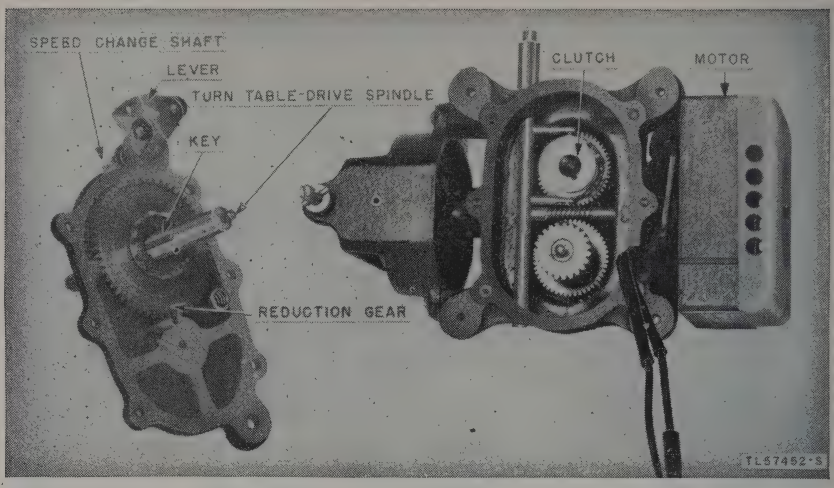


Figure 25. Phono-motor gear case, disassembled.

c. CLEANING AND LUBRICATING GEARS.

Note. Nomenclature of cleaning and lubricating symbols appears in paragraph 33.

(1) Brush all parts with SD and allow to dry.

(2) Reinstall the oil pad and wicks in the bottom of the gear case. Rotate the wick bracket to the original position. Insert the flat steel spring and press it down evenly so that the felt oil pad will be held tight.

(3) Saturate the oil pad with PL.

(4) Coat the hub of the reduction gear (fig. 24) lightly with GL. Reassemble it to the gear-case cover.

(5) Apply a light coat of GL to the gear teeth of all gears and reinsert the gears into the gear case as shown in figure 25.

(6) Apply a light coat of GL to the bearing surfaces of the turntable-drive spindle and insert the spindle into the hub of the reduction gear. Replace the key carefully in the spindle to prevent burring. (See fig. 25.) Slide the clutch over the key to insure free motion. If burring is present, remove the key and file with a fine file and clean thoroughly to remove filings. Reinsert spindle into clutch.

(7) Apply 1 to 2 drops of PL to the bearing ends of the speed-change-cross shaft and to the pivots of the shifting fork. (See fig. 24.)

(8) Apply a light coat of GL to the clutch and place it on top of the high-speed gear assembly (78 rpm). Engage the clutch with the shifting fork.

(9) Carefully place the paper gasket on the gear case and match the screw holes.

(10) Carefully reinstall the gear-case cover. Align the bearing in the cover with the shaft of the low-speed-gear assembly. Mate the clutch to the keyed shaft of the turntable-drive spindle. Press the cover down over the gear case and replace the four screws.

(11) Apply 1 or 2 drops of PL to the speed-shift lever and shaft (figs. 25 and 26) located on top of the gear-case cover.

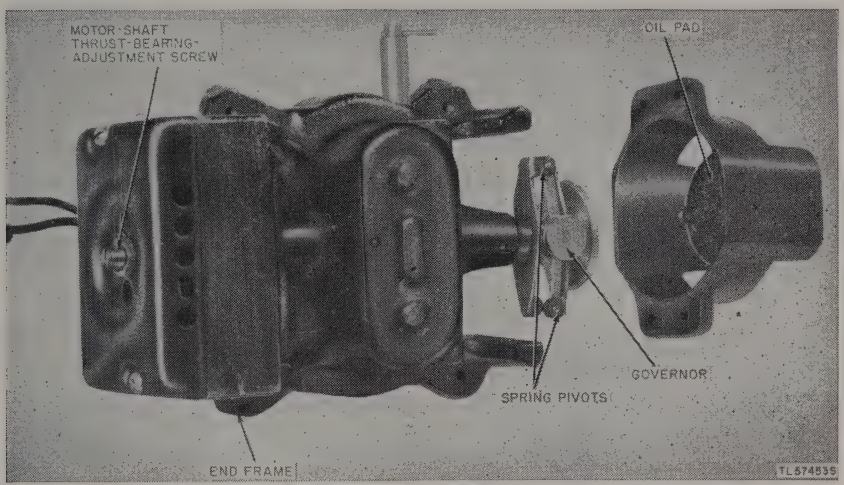


Figure 26. Phono-motor governor and thrust-bearing-adjustment screw.

d. Motor-Thrust-Bearing Disassembly (Fig. 26). (1) Loosen the locknut of the slotted motor-thrust-bearing adjustment.

(2) Unscrew the thrust bearing and remove it from the end frame of the motor.

e. Lubrication of Motor-Thrust Bearing (Fig. 26). (1) Remove old lubricant from the thrust bearing and mating end of the motor shaft with SD and wipe dry.

(2) Apply a light coat of GL to the thrust bearing. (Avoid excessive application of grease.)

(3) Reinstall the thrust bearing back into the motor-end frame and tighten until no shaft end play exists. Hand-tighten the locknut. Back off one-quarter turn on the thrust bearing screw and tighten the locknut securely. The resulting end of the motor shaft should be just perceptible when the shaft is moved endwise by hand.

f. Speed Control Disassembly and Cleaning (Fig. 26). (1) Remove the four screws holding the governor housing. Pull off the housing frame.

(2) Remove the felt oil pad from the cup and clean the pad and cup with SD.

(3) Brush the friction disk and springs of the governor with SD.

g. Speed Control Lubrication and Reassembly. (1) Reinstall the oil pad in the cup and saturate with PL. Do not apply oil excessively; just saturate the pad.

(2) Apply 1 drop of PL to each pivot of the governor springs.

(3) Reassemble the governor housing to the motor assembly.

(4) Apply 1 to 2 drops of PL to the speed-regulator cam and shaft.

(5) Reassemble the motor assembly to the mounting plate.

(6) Connect the speed control levers and the heating element.

(7) Test the operation of the turntable motor at 33-1/3 and 78 rpm.

APPENDIX I

IDENTIFICATION TABLE OF REPLACEABLE PARTS

1. Identification Table of Replaceable Parts for Public Address Set AN/TIQ–2

The following information was compiled on 15 January 1947. The appropriate sections of the War Department Supply Catalog for Public Address Set AN/TIQ–2 are:

Organizational and Higher Echelon Spare Parts
SIG 7 & 8–AN/TIQ–2 (when published).
SIG 7 & 8–HS/30, October 1945.

For an index of available catalog sections, see the latest issue of War Department Supply Catalog SIG 1 & 2, Introduction and Index.

Ref. symbol	Name of part and description	Signal Corps stock No.
	PUBLIC ADDRESS SET AN/TIQ–2	
	PUBLIC ADDRESS SET AN/TIQ–2: power output rating 20 w; portable; input 115 or 230 v, 60 cyc, single ph, 200 w; includes record player for 10", 12", and 16" records at 33-1/3 rpm or 78 rpm; over-all dimen. 36" lg x 20" wd x 40" h; Sig C spec #271–3023.	6C200–2
	AMPLIFIER AM–20/TIQ–2 (see par. 67).	2C449–20
	TURNTABLE MX–39/TIQ–2 (see par. 68).	6C450–2
	HEADSET HS–30 (see SIG 7 & 8–HS–30).	2B830
W201 W202	CABLE ASSEMBLY, power: Army-Navy Cord CX–49/TIQ–2; uses Sig C Cordage CO–144; 2 #18 AWG cond ea comprising 41 #34 AWG strands; RC; ¼" OD; 10 ft lg; w/AN type AN–3106–20–7S, 8 cont female connector one end; Hubbell #7102, 2 cont male connector other end (power cord for amplifier and turntable).	3E6000–49

Ref. symbol	Name of part and description	Signal Corps stock No.
W203	CABLE ASSEMBLY, power: Army-Navy Cord CX–53/TIQ–2; 2 #16 AWG stranded cond; rubber insulated and jacketed; 25 ft lg; w/Hubbell #7102, 2 cont male connector one end; 4 Hubbell #ON–11546, 2 cont female connectors mtd on junction box other end (provides outlet for connecting power cords to amplifier and turntable).	3E6000–53
W204	CABLE ASSEMBLY, power: Army-Navy Cord CX–54/TIQ–2; 2 #16 AWG stranded cond; rubber insulated and jacketed; 25 ft lg; w/Hubbell #7101, 2 cont female connector one end; Hubbell #7102, 2 cont male connector other end (power extension cord).	3E6000–54–300
W205	CABLE ASSEMBLY, power: Army-Navy Cord CX–55/TIQ–2; uses UL type "S" cordage; 2 #18 AWG stranded cond; rubber insulated and jacketed; 36″ lg; w/Hubbell #7101, 2 cont female connector one end; Hubbell #7057, 2 cont male connector other end (adapts power cords to standard AC outlets).	3E6000–55
W206	CABLE ASSEMBLY, special purpose: Army-Navy Cord CX–51/TIQ–2; single #20 AWG stranded cond, shielded; RC; 10 ft lg; w/Sig C Plug PL–55, 2 cond telephone plug ea end (connects turntable pick-up to amplifier).	3E6000–51
J209 J210	CONNECTOR, plug: single round female cont; straight; 2-1/16″ lg × ¾″ diam over-all; cylindrical metal body; bakelite insert; coil spring cord protector; Amphenol #MC1F (part of Cord CX–50/TIQ–2).	2Z8671.23
J203 J204 J205 J206	CONNECTOR, plug: 2 female "Twist-Lock" cont; straight; 3″ lg × 1⅜″ wd × 1-1/16″ d; glazed ceramic metal w/metal mtg strap; Hubbell "Twist-Lock" #11546 (part of Cord CX–53/TIQ–2).	2Z3063–66
J207 J208	CONNECTOR, plug: 2 female "Twist-Lock" cont; straight; 2-5/16″ lg × 1-11/16″ OD over-all; cylindrical bakelite body; ½″ cable opening; w/cable clamp; Hubbell "Twist-Lock" #7101 (part of Cords CX–54/TIQ–2 and CX–55/TIQ–2).	6Z3149

Ref. symbol	Name of part and description	Signal Corps stock No.
P205	CONNECTOR, plug: 2 parallel blades, type male cont; straight; 2″ lg × 1-11/16″ diam over-all; metal shell on bakelite body; w/ cable clamp; Hubbell #7057 (part of Cord CX–55/TIQ–2).	6Z1727
P201 P202 P203 P204	CONNECTOR, plug: 2 prong type "Twist-Lock" male cont; straight; 2″ lg × 1-11/16″ OD over-all; metal shell on bakelite body; ½″ cable opening; w/cable clamp; Hubbell "Twist-Lock" #7102 (part of Cords CX–49/ TIQ–2, CX–53/TIQ–2, and CX–54/TIQ–2).	6Z1735.4
J211 J212	CONNECTOR, plug: 3 round female cont; straight; 1-7/16″ lg × 1″ OD over-all; cylindrical metal body; bakelite insert; AN type AN–3101–14S–7S (part of Cord CX–56/ TIQ–2).	2Z3023–54
P208 P209 P210 P211	CONNECTOR, plug: 3 round male cont; straight; 1-11/32″ lg × 1-1/16″ diam; cylindrical metal body; bakelite insert; w/cable clamp; AN type AN–3106–14S–7P (part of Cords CX–49/TIQ–2 and CX–56/TIQ–2).	2Z7113.35
J201 J202	CONNECTOR, plug: 8 round female cont; straight; 2⅛″ lg × 1-15/32″ diam over-all; cylindrical metal body, bakelite insert; w/ cable clamp; AN type AN–3106–20–7S (part of Cord CX–49/TIQ–2).	2Z3069–6
W207 W208	CORD, microphone: Army-Navy Cord CX–50/ TIQ–2; single #20 AWG stranded cond, shielded; RC; 25 ft lg; w/AN type AN–3106–14S–7P, 3 cont male connector one end; Amphenol #MC1F, single cont female connector other end (connects microphone to amplifier).	3E6000–50
W209 W210	CORD, microphone: Army-Navy Cord CX–56/ TIQ–2; single #20 AWG stranded cond, shielded; RC; 25 ft lg; w/AN type AN–3101 –14S–7S, 3 cont female connector one end; AN type AN–3106–14S–7P, 3 cont male connector other end (microphone extension cord).	3E6000–56
	MICROPHONE M–2/U: dynamic; impedance 100 ohms; uni-directional; 3-15/16″ lg × 2-1/16″ diam over-all; w/swivel pin for altering angle of elevation.	2B1657–2

Ref. symbol	Name of part and description	Signal Corps stock No.
P206 P207	PLUG PL–55: telephone; 2 cond; single shank; tubular black bakelite shell; shank 1-7/32" lg × ¼" diam; shell 1⅝" lg × ½" diam; 2-27/32" lg over-all; Sig C dwg #SC–D–339 (part of Cord CX–51/TIQ–2).	2Z7155
	REEL RL–3: wire; metal; flat rectangular frame; 11¾" × 10" over-all; w/metal handle.	2A3103
LS1 LS2	SPEAKER, dynamic: Army-Navy Loudspeaker LS–103/TIQ–2; diaphragm type, PM; output 20 w normal, 25 w peak; voice coil impedance 15 ohms; 25" lg × 19" diam over-all; output transformer tapped for 250, 500, 1,000, or 2,500 ohms impedance.	6C42–103
A203 A204	STAND, microphone: telescoping; 4 sect folding tripod base; steel; folded 21½" lg × 2¼" diam over-all; Eastern Mike #EE–74.	2B2193–2
A201 A202	STAND, speaker: Army-Navy Loudspeaker Stand MT–128/TIQ–2; tripod w/extending legs; wood; max lg 78", collapsed lg 46¾", 7½" diam.	6C83–128

2. Identification Table of Replaceable Parts for Amplifier AM–20/TIQ–2

Ref. symbol	Name of part and description	Signal Corps stock No.
	AMPLIFIER AM–20/TIQ–2	
	AMPLIFIER AM–20/TIQ–2: 20 w/output; 3 db from 60 cyc to 10,000 cyc; 21½" lg × 16" wd × 10" h; 115/230 v, 60 cyc, single ph; 6 input channels, 2 for 100,000 ohms high impedance microphone, 2 for 100 ohms low impedance dynamic microphone, 1 for 100 ohms impedance phone or line, one for 50,000 or 100 ohms impedance radio or carbon microphone; output impedances 250, 125, 60, and 30 ohms; wooden case.	2C449–20
B1	BLOWER: centrifugal vane; 24 metal fan blades; guarded; motor 1/250 hp, 3,100 rpm, 60 cyc, single ph, 110 v AC; 4-1/16" × 3-17/32" × 3-43/64" over-all; Eastern Devices #J–50 ac.	3H388–14

Ref. symbol	Name of part and description	Signal Corps stock No.
01 02	CAP: connector; metal; 7/16″ lg × ¾″ diam; w/chain; Amphenol #CCC–1 (dustproofs J1 and J2).	2Z1612.19
C6	CAPACITOR, fixed: paper; 1,000 mmf ± 20%; 800 vdcw; molded phenolic case; max body dimen 53/64″ sq × 9/32″ thk; JAN type CN30A102M.	3DA1–199
C5	CAPACITOR, fixed: paper; 6,000 mmf ± 20%; 600 vdcw; HS; 1″ lg × ½″ diam; oil-filled; JAN type CP26A1EF602M.	3DA6–102
C7	CAPACITOR, fixed: paper; 10,000 mmf ± 20%; 600 vdcw; HS; 1¼″ lg × ½″ diam; oil-filled; JAN type CP26A1EF103M.	3DA10–388
C2 C3 C4 C8 C15	CAPACITOR, fixed: paper; 50,000 mmf ± 10%; 600 vdcw; HS; 1½″ lg × 11/16″ diam; oil-filled; JAN type CP26A1EF503K.	3DA50–224
C22	CAPACITOR, fixed: paper; 1 mf +20% —10%; 600 vdcw; HS; 1-5/16″ lg × 49/64″ wd × 2¾″ h; oil-filled; JAN type CP65B1EF105V.	3DB1–14
C13 C14 C16 C17 C18 C19	CAPACITOR, fixed: paper; 4 mf +40% —15%; 600 vdcw; HS; 2½″ lg × 1-3/16″ wd × 3⅞″ h; oil-filled; uses bracket; JAN type CP07–B4; JAN type CP70E1EF405X.	3DB4–273
C1 C9 C10 C12	CAPACITOR, fixed: electrolytic; 50 mf; 25 vdcw; 1-13/16″ lg × 1″ wd × 1-5/16″ h; JAN type CE63F500F.	3DB50–54
C11	CAPACITOR, fixed: electrolytic; 50 mf; 50 vdcw; 1-13/16″ lg × 1″ wd × 1-15/16″ h; JAN type CE63F500G.	3DB50–55
C20 C21	CAPACITOR, fixed: electrolytic; 100 mmf; 50 vdcw; 2¼″ lg × 1″ diam; JAN type CE31F101G.	3DB100–39
A5	CLEANER, air: cartridge type; metal container; 9¾″ × 1⅞″ × ⅝″ over-all; Cardwell dwg #200157.	6Z3856–71

Ref. symbol	Name of part and description	Signal Corps stock No.
P1 P2	CONNECTOR, receptacle: single round male cont w/ground through shell; straight; 21/32″ lg × ⅝″ diam less solder lug; cylindrical aluminum body; bakelite insert; Amphenol type 75–PC1M.	2Z7111.28
J1 J2	CONNECTOR, receptacle: 3 round polarized female cont; straight type; 29/32″ lg w/ 1-3/16″ sq flange; cylindrical metal body; bakelite insert; AN type AN–3102–14S–7S.	2Z3064–8
J7	CONNECTOR, receptacle; 5 round polarized female cont; straight type; 29/32″ lg w/ 1-3/16″ sq flange; cylindrical metal body; bakelite insert; AN type AN–3102–14S–5S.	2ZK7409–20
P3	CONNECTOR, receptacle: 8 round polarized male cont; straight; 1-11/32″ lg w/1½″ sq flange; cylindrical aluminum body; bakelite insert; AN type AN–3102–20–7P.	2Z7118–22
	COVER: dust cover for toggle switches; consists of nut, cap, one rubber and one steel washer; C–H #6916K615.	3Z9849.39–1/B1
F1	FUSE, cartridge: 5 amp; 250 v; glass body; ferrule term; 1¼″ lg × ¼″ diam over-all; Littelfuse #1358.	3Z2605.2
E4	HOLDER, fuse: extractor post; for single #3AG fuse; bakelite; 8 amp, 125 v AC max rating; 2½″ lg × 11/16″ diam; Buss #HCM.	3Z2876–6.1
	HOUSING: blower; bakelite; 2 sect; 3-17/32″ × 3-43/64″ × 1⅜″ over-all; L-R #2.	3H388–14/1
J4	JACK JK–33–A: telephone; for 3 cond 0.205″ diam plug; 1¼″ lg × ⅞″ diam over-all; Sig C dwg #SC–D–2332.	2Z5533A
J3 J5 J6	JACK JK–34–A: telephone; for 2 cond 0.250″ diam plug; 1¼″ lg × 1″ wd × ¾″ h; J1 cont arrangement; Sig C dwg #SC–D–2339.	2Z5534
	KNOB: hex.; black bakelite; for ¼″ shaft; single #8–32 set-screw; 1⅛″ diam × 13/16″ lg; ICA #1166.	2ZK5822–32
E3	LAMP LM–27: incandescent; 6–8 v, 0.25 amp; Mazda #44, bulb T–3–¼ clear; 1⅛″ lg over-all; miniature bayonet base; Sig C dwg #SC–D–2373, item 3.	2Z5927

Ref. symbol	Name of part and description	Signal Corps stock No.
I1	LIGHT, indicator: w/red frosted lens; for bayonet base lamp; inclosed frame; metal body; 2½" lg × ¾" diam; 2 solder lug term at rear; Dialco #DP90F.	2Z5883–181
E1 E2	POST, binding: screw type; 1-9/16" × 19/32" diam, #12-24 × ¾" mtg stem; knurled cap; Eby #96V telepost.	3Z737–19
L1	REACTOR: choke; single winding; 10 hy, 55 ma; 400 ohms DC resistance; 1⅝" × 1⅞" × 3¼" h less term; HS; Freed #12410.	3C323–6Z6
L2	REACTOR: choke; single winding; 15 hy, 5 ma; 400 ohms DC resistance; 1⅝" × 1⅞" × 2½" h less term; HS; Freed #12403.	3C323–6Z4
L3	REACTOR: choke; single winding; 10 hy, 150 ma; 150 ohms DC resistance; 3⅜" sq × 4" h; HS; Freed #12402.	3C323–6Z5
R33	RESISTOR, fixed: composition; 100 ohms ± 10%; 1 w; max body dimen 0.750" lg × 0.280" diam; JAN type RC30BF101K.	3RC30BF101K
R23	RESISTOR fixed: composition; 100 ohms ± 10%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF101K.	3RC20BF101K
R24	RESISTOR, fixed: composition; 270 ohms ± 10%; 1 w; max body dimen. 0.750" lg × 0.280" diam; JAN type RC30BF271K.	3RC30BF271K
R20 R34	RESISTOR, fixed: wire wound; 250 ohms ± 5%; 15 w; body dimen 1⅜" lg × ¾" diam less term; JAN type RW16F251.	3RW20716
R19	RESISTOR, fixed: composition; 1,000 ohms ± 10%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF102K.	3RC20BF102K
R18	RESISTOR, fixed: composition; 2,200 ohms ± 10%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF222K.	3RC20BF222K
R2 R15	RESISTOR, fixed: composition; 2,700 ohms ± 10%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF272K.	3RC20BF272K
R12	RESISTOR, fixed: composition; 3,000 ohms ± 5%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF302J.	3RC20BF302J

Ref. symbol	Name of part and description	Signal Corps stock No.
R13	RESISTOR, fixed: wire wound; 3,100 ohms ± 5%; 15 w; body dimen 1⅜" lg × ¾" diam less term; JAN type RW16F312.	3RW27314
R22	RESISTOR, fixed: composition; 4,700 ohms ± 10%; 1 w; max body dimen 0.750" lg × 0.280" diam; JAN type RC30BF472K.	3RC30BF472K
R21	RESISTOR, fixed; wire wound; 5,000 ohms ± 5%; 20 w; body dimen 1-15/16" lg × ¾" diam less term; JAN type RW15F502.	3RW28506
R32	RESISTOR, fixed: wire wound; 10,000 ohms ± 5%; 40 w; body dimen 3-7/16" lg × 1" diam less term; JAN type RW14F103.	3RW30304
R1 R6 R8 R14 R16 R27	RESISTOR, fixed: composition; 47,000 ohms ± 10%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF473K.	3RC20BF473K
R7	RESISTOR, fixed: composition; 68,000 ohms ± 10%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF683K.	3RC20BF683K
R11	RESISTOR, fixed: composition; 100,000 ohms ± 5%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF104J.	3RC20BF104J
R28 R29 R30 R31	RESISTOR, fixed: composition; 100,000 ohms ± 10%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF104K.	3RC20BF104K
R10	RESISTOR, fixed: composition; 220,000 ohms ± 10%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF224K.	3RC20BF244K
R3 R17	RESISTOR, fixed: composition; 270,000 ohms ± 10%; ½ w; max body dimen 0.468" lg × 0.249" diam; JAN type RC20BF274K.	3RC20BF274K
R9	RESISTOR, variable (potentiometer): composition; 500,000 ohms ± 10%; ½ w; 3 term; 1¼" diam × 9/16" thk; linear taper; IRC type CS, 11–133.	2Z7272–15

Ref. symbol	Name of part and description	Signal Corps stock No.
R4 R5 R25 R26	RESISTOR, variable (potentiometer): composition; 500,000 ohms ± 10% ½ w; 3 term; 1¼" diam × 9/16" thk; IRC type CS, 13–133.	3Z6750–13
X1 through X6	SOCKET, tube: octal; ceramic, 1⅛" diam × ½" h less term; Ucinite #115001–1.	2Z8678–122
S1	SWITCH, toggle; SPDT; 15 amp, 125 v AC; phenolic body; max body dimen 1-9/64" × 41/64" × 1-1/16"; w/radioactive indicating lever; JAN type ST42D.	3Z9863–42D.1
S3	SWITCH, toggle; DPST; 25 amp, 125 v AC; phenolic body; max body dimen 1-1/16" × 49/64" × 1-21/64"; w/radioactive indicating lever; JAN type ST52K.	3Z9863–52K.1
S2	SWITCH, toggle: DPDT; 25 amp, 125 v AC; phenolic body; max body dimen 1-9/64" × 41/64" × 1-21/64"; w/radioactive indicating lever; JAN type ST52N.	3Z9863–52N.1
	TIP, handle: radioactive; metal; 9/32" diam × ½" lg over-all w/tapered spring body; JAN type STR01.	3Z9863T
T6	TRANSFORMER, AF: input type; pri 100 ohms impedance; secd 50,000 ohms impedance; HS; 1⅞" lg × 1⅝" wd × 2½" h; Freed #12405.	2Z9631.324
T3 T4 T5	TRANSFORMER, AF: input type; pri 100 ohms impedance, secd 100,000 ohms impedance; HS; 2¼" lg × 2⅛" wd × 4" h; Freed #12404.	2Z9631.323
T1	TRANSFORMER, AF: plate coupling type; pri 9,000 ohms impedance CT; secd 250 ohms impedance tapped at 30, 60, and 125 ohms; HS; 3⅜" lg × 3⅛" wd × 4¼" h; Freed #12406.	2Z9632.453
T2	TRANSFORMER, power: fil and plate; input 220/110 v, 60 cyc, single ph; 3 output windings, secd #1, 365/0/365 v, 150 ma; secd #2, 5 v, 3 amp; secd #3, 6.3 v, 5 amp; CT; HS; 5⅛" lg × 4⅜" wd × 4½" h; Freed #12401.	2Z9607–25

Ref. symbol	Name of part and description	Signal Corps stock No.
V6	TUBE, electron: JAN–5U4G.	2J5U4G
V4 V5	TUBE, electron: JAN–6L6GAY.	2J6L5GAY
V1 V2 V3	TUBE, electron: JAN–6SL7GT.	2J6SL7GT

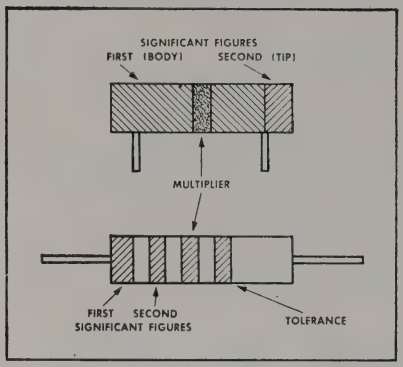
3. Identification Table of Replaceable Parts for Turntable MX–39/TIQ–2

Ref. symbol	Name of part and description	Signal Corps stock No.
	TURNTABLE MX–39/TIQ–2	
	TURNTABLE MX–39/TIQ–2: reproducer; operates from 115 v or 230 v, 60 cyc AC, single ph motor; plays 10″, 12″, or 16″ records at 33-1/3 rpm or 78 rpm; 90 w; 21″ lg × 16″ wd × 10″ h.	6C450–2
P101	CONNECTOR, receptacle: 8 round male cont; straight; 1-11/32″ lg w/1½″ sq flange; cylindrical metal body; bakelite insert; AN type AN–3102–20–7P.	2Z7118.22
	COVER: dust cover for toggle sw; consists of nut, cap, and 1 rubber and 1 steel washer; CH #8916K615.	3Z9849.39–1/B1
F101	FUSE FU–26: cartridge; 1 amp; 250 v; glass body; ferrule term; 1¼″ lg × ¼″ diam over-all.	3Z1926
E101	HEAD, reproducer: electrical; dynamic type, 100 ohms impedance; 13½″ lg × 2¾″ wd × 2-1/16″ h over-all; 2 wire leads from rear; Audak #L–18.	6C176–2
HL101	HEATING ELEMENT, electrical: cartridge type; 115 v, 75 w; single sect; metal cylinder form; 2⅜″ lg × ⅜″ diam over-all; maintains proper temp for motor; GE #2A65.	2Z5015–87
E–102	HOLDER, fuse: extractor post; for single #3AG fuse; bakelite; 2½″ lg × 11/16″ diam; Buss #HCM.	3Z1939.1

Ref. symbol	Name of part and description	Signal Corps stock No.
J101	JACK JK–34–A: telephone; for 2 cond. 0.250″ diam plug; 1¼″ lg × 1″ wd × ¾″ h; J1 cont arrangement; Sig C dwg #SC–D–2339.	2Z5534
B101	MOTOR, AC: induction type; drives turntable at 78 rpm or 33-1/3 rpm; closed frame; 8⅛″ lg × 7⅛″ wd × 4½″ h over-all; 115 v or 230 v, 60 cyc, AC, single ph; 25 w; Genind Co model 4–D.	3H3000–133
O101	NEEDLE, reproducer: platinum tipped: spcl brass shank; Permo #100.	6C92
S101	SWITCH, thermostatic: SPST; operating range 45° F to 55° F; 125 v, AC, 60 cyc, 10 amp; metal body; 2⅜″ lg × 1⅝″ wd × 13/16″ h over-all; Spencer Thermo #C4351–17.	3Z9695–15
S103	SWITCH, toggle: SPST; 15 amp, 125 v AC; phenolic body; 1-9/64 × 41/64″ × 1-1/16″; w/radioactive indicating lever; JAN type ST–42A w/JAN type STR01 tip.	3Z9863–42A.1
S102	SWITCH, toggle: SPDT; 15 amp, 125 v AC; phenolic body; 1-9/64″ × 41/64″ × 1-1/16″; w/radioactive indicating lever; JAN type ST–42E w/JAN type STR01 tip.	3Z9863–42E.1
T101	TRANSFORMER, power: fixed autotransformer; input 230 v/115 v, 60 cyc; single ph; output 230 v/115 v, 30 w; HS metal case; 2-15/16″ × 2-9/16″ × 3¾″; Freed #13746.	2Z9621–129

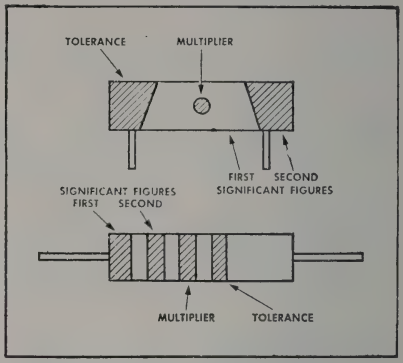
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS



Insulated fixed composition resistors with axial leads are designated by a natural tan background color. Non-insulated fixed composition resistors with axial leads are designated by a black background color

JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS



Resistors with axial leads are insulated. Resistors with radial leads are uninsulated.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	
RED	2	100	
ORANGE	3	1,000	
YELLOW	4	10,000	
GREEN	5	100,000	
BLUE	6	1,000,000	
VIOLET	7	10,000,000	
GRAY	8	100,000,000	
WHITE	9	1,000,000,000	
GOLD		0.1	5
SILVER		0.01	10
NO COLOR			20

Example: A 50,000-ohm resistor with a standard tolerance of 20 percent (no color) would be indicated by a green ring (5), a black ring (0), and an orange ring (000)

RMA: Radio Manufacturers Association
JAN: Joint Army-Navy

TL 13418 A

① *Capacitor color code.*
Figure 27.

JOINT ARMY-NAVY TYPE DESIGNATION CODES FOR ELECTRICAL COMPONENTS

INTRODUCTION: Fixed and variable resistors and fixed capacitors manufactured under JAN specifications may be labeled with a *type designation code* instead of a color code or actual electrical value. For resistors and capacitors marked with the JAN type designation code, electrical values and other data can be determined by consulting the following information.

RESISTORS

FIXED, COMPOSITION

COMPONENT: RC signifies *fixed, composition resistor.*

STYLE: A two-digit symbol indicates power rating and physical size.

Resistor style	Wattage
RC10, RC15, RC16	¼ WATT
RC20, RC21, RC25	½ WATT
RC30, RC31, RC35, RC38	1 WATT
RC40, RC41, RC45	2 WATTS
RC65	4 WATTS
RC75, RC76	5 WATTS

RESISTANCE: A three-digit symbol indicates the resistance value in ohms. The first two digits give the first two figures of the resistance value; the third digit gives the number of zeros which follow the first two figures.

RESISTORS

VARIABLE, WIRE-WOUND

COMPONENT: RA signifies *variable, wire-wound resistor.*

STYLE: A two-digit symbol indicates power rating and physical size and shape.

SWITCH: Symbol A indicates no switch. Symbol B indicates a switch turned ON at start of clockwise rotation.

RESISTANCE: A three-digit symbol indicates the resistance value in ohms. The first two digits give the first two figures of the resistance value; the final digit gives the number of zeros which follow the first two figures. The letter *R* may be substituted to represent a decimal point; but when *R* is used, the last digit of the group becomes significant.

RHEOSTATS

WIRE-WOUND, POWER-TYPE

COMPONENT: RP signifies all *rheostats.*

STYLE: Same as for variable, wire-wound resistors.

OFF POSITION:

Numeral	OFF position
1	None.
2	At end of counterclockwise rotation.
3	At end of clockwise rotation.

RESISTANCE: Same as for variable, wire-wound resistors.

*Items starred are of interest primarily to depot and higher echelon repair personnel.

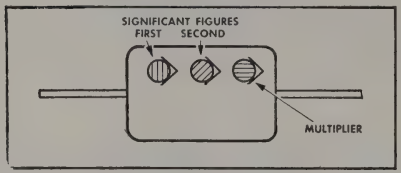
TL 18141

② *Capacitor data.*

Figure 27—Continued.

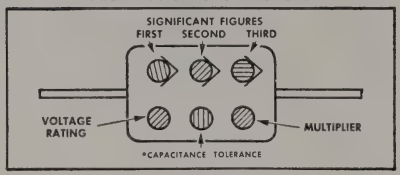
CAPACITOR COLOR CODES

RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

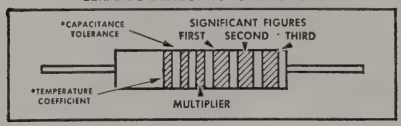


Capacitors marked with this code have a voltage rating of 500 volts.

RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

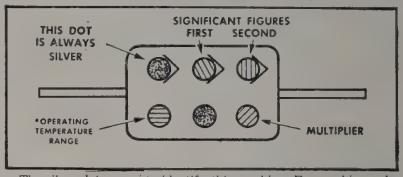


Capacitors marked with this code have a voltage rating of 500 volts.

RMA Radio Manufacturers Association JAN Joint Army-Navy

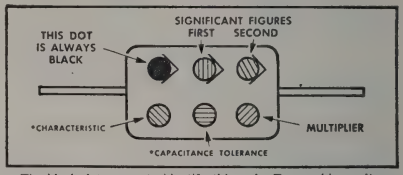
Note These color codes give all capacitances in micromicrofarads.
*Items marked with an asterisk are of interest primarily to depot and higher echelon repair personnel

JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



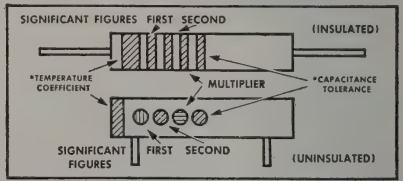
The silver dot serves to identify this marking. For working voltages see JAN type designation code.

JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



The black dot serves to identify this code. For working voltages see JAN type designation code.

JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS



Capacitors marked with this code have a voltage rating of 500 volts. Either the band or dot code may be used.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER			RMA VOLTAGE RATING
		RMA MICA-AND CERAMIC-DIELECTRIC	JAN MICA-AND PAPER-DIELECTRIC	JAN CERAMIC-DIELECTRIC	
BLACK	0	1	1	1	
BROWN	1	10	10	10	100
RED	2	100	100	100	200
ORANGE	3	1,000	10,000	1,000	300
YELLOW	4	10,000			400
GREEN	5	100,000			500
BLUE	6	1,000,000			600
VIOLET	7	10,000,000			700
GRAY	8	100,000,000		0.01	800
WHITE	9	1,000,000,000		0.1	900
GOLD		0.1	0.1		1,000
SILVER		0.01	0.01		2,000
NO COLOR					500

1L 12417 A

① *Resistor color codes.*

Figure 28.

CAPACITORS

FIXED, MICA-DIELECTRIC

CM	20	B	511	K
COMPONENT	CASE	*CHARACTERISTIC	CAPACITANCE	*TOLERANCE

COMPONENT: CM signifies *fixed, mica-dielectric capacitor.*

CASE: A two-digit symbol identifies a physical case size and shape.

CAPACITANCE: A three-digit symbol indicates the capacitance value in micromicrofarads. The first two digits give the first two figures of the capacitance value; the final digit gives the number of zeros which follow the first two figures. When more than two significant figures are required, additional digits may be used, the last digit always indicating the number of zeros.

D-C WORKING VOLTAGE FOR CAPACITANCE RANGE

Case	Capacitance range	Vdcw
CM20	5-510 mmf	500
CM25	5-1,000 mmf	500
CM30	470-3,300 mmf	500
CM35	470-6,200 mmf	500
	6,800-10,000 mmf	500
CM40	3,300-8,200 mmf	500
	9,100-10,000 mmf	300

NOTE: Working voltages for capacitors above CM40 are stamped on the case.

The d-c working voltage of a capacitor can be determined from the above table when the case size and value of capacitance are known.

CAPACITORS

FIXED, MOLDED, PAPER-DIELECTRIC†

CN	36	A	302
COMPONENT	CASE	*CHARACTERISTIC	CAPACITANCE

COMPONENT: CN signifies *fixed, molded, paper-dielectric capacitor.*

CASE: Same as for fixed, mica-dielectric capacitors.

CAPACITANCE: A three-digit symbol indicates the capacitance value in micromicrofarads. The first two digits give the first two figures of the capacitance value; the third digit gives the number of zeros which follow the first two figures.

D-C WORKING VOLTAGE FOR CAPACITANCE RANGE

Case	Capacitance	Vdcw
CN35	3,000 mmf	800
	6,000 mmf	600
	10,000 mmf	400
CN36	3,000 mmf	400
	6,000 mmf	400
	10,000 mmf	300
CN40	3,000 mmf	400
	6,000 mmf	300
	10,000 mmf	300
CN41	3,000 mmf	600
	6,000 mmf	600
	10,000 mmf	400

The d-c working voltage of a capacitor can be determined from the above table when the case size and value of capacitance are known.

CAPACITORS

FIXED, CERAMIC-DIELECTRIC

CC	20	AH	100	G
COMPONENT	CASE	*CHARACTERISTIC	CAPACITANCE	*TOLERANCE

COMPONENT: CC signifies *fixed, ceramic-dielectric capacitor.*

CASE: Same as for fixed, mica-dielectric capacitors.

CAPACITANCE: Same as for fixed, molded, paper-dielectric capacitors.

NOTE: All fixed, ceramic-dielectric capacitors have a working voltage of 500 volts, d-c.

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*Items starred are of interest primarily to depot and higher echelon repair personnel.

†This is not a JAN specification. These capacitors are covered by AWS C75/221.

TL 18142

② *Resistor data.*

Figure 28—Continued.

APPENDIX II
REFERENCES

Note. For availability of items listed check FM 21–6, and WD Signal Supply Catalog SIG 1 & 2. Also see FM 21–6 for applicable Technical Bulletins, Supply Bulletins, Modification Work Orders, and changes.

1. Parts List

SIG 1 & 2	War Department Signal Supply Catalog, Introduction and Index.
SIG 3	List of Items for Troop Issue.
SIG 4–1	Allowances for Expendable Supplies for Schools, Training Centers, and Boards.
SIG 5	Stock List of All Items.
SB 11–17	Electron Tube Supply and Reference Data.
SB 11–76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.

2. Technical Manuals on Test Equipment

TM 11–472	Repair and Calibration of Electrical Measuring Instruments.
TM 11–2613	Voltohmmeter I–166.
TM 11–2626	Test Unit I–176.
TM 11–2627	Tube Tester I–177.

3. Shipping Instructions

U. S. Army spec No. 100–14A.	Army-Navy General Specification for Packaging and Packing for Oversea Shipment.

4. Other Publications

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TM 1–455	Electrical Fundamentals.
TM 11–453	Shop Work.
TM 11–462	Signal Corps Reference Data.

5. List of Abbreviations and Symbols

ac	Alternating current (noun)
a-c	Alternating-current (adjective)
B	High voltage for the plate and screen circuits
B—	B minus (low side of plate supply voltage)
C	Capacitor or capacitance
GL	Grease, Lubricating, Special
hy	Henry
incl	Inclusive
JAN	Joint Army and Navy
kc	Kilocycle
L	Inductor or inductance
meg	Megohms (million ohms)
mf	Microfarad
MFP	Moistureproofing and fungiproofing
PL	Oil, Lubricating, Preservative, Special
R	Resistor
rpm	Revolutions per minute
SD	Solvent, Dry Cleaning
V	Volts

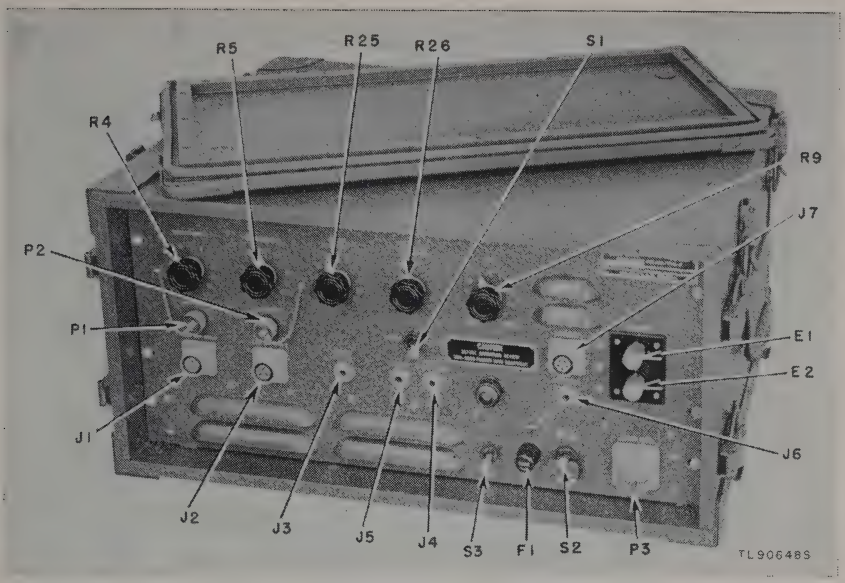

Figure 29. Amplifier AM–20/TIQ–2, front view, parts identification.

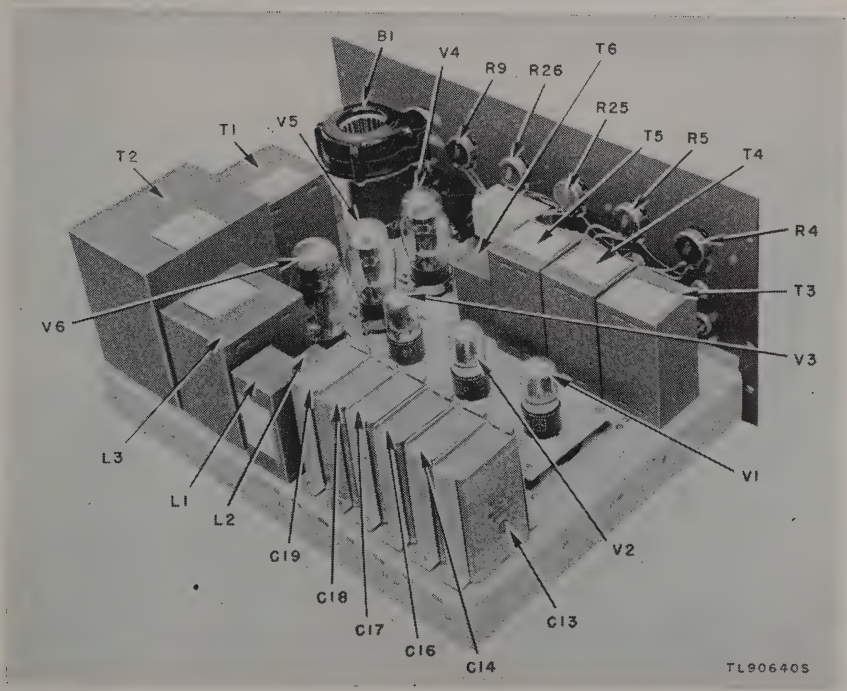

Figure 30. Amplifier AM–20/TIQ–2, top view, parts identification.

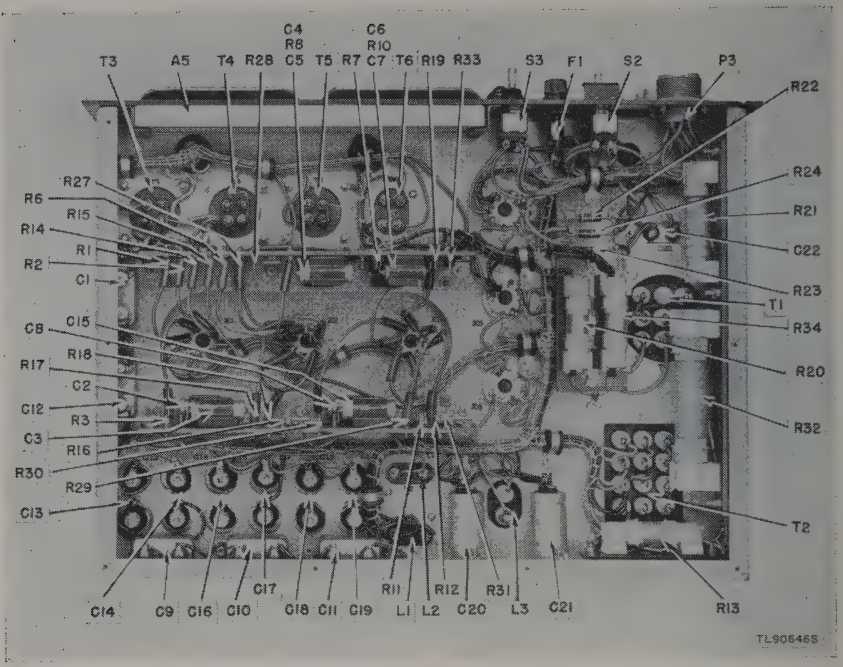

Figure 31. Amplifier AM–20/TIQ–2, bottom view, parts identification.

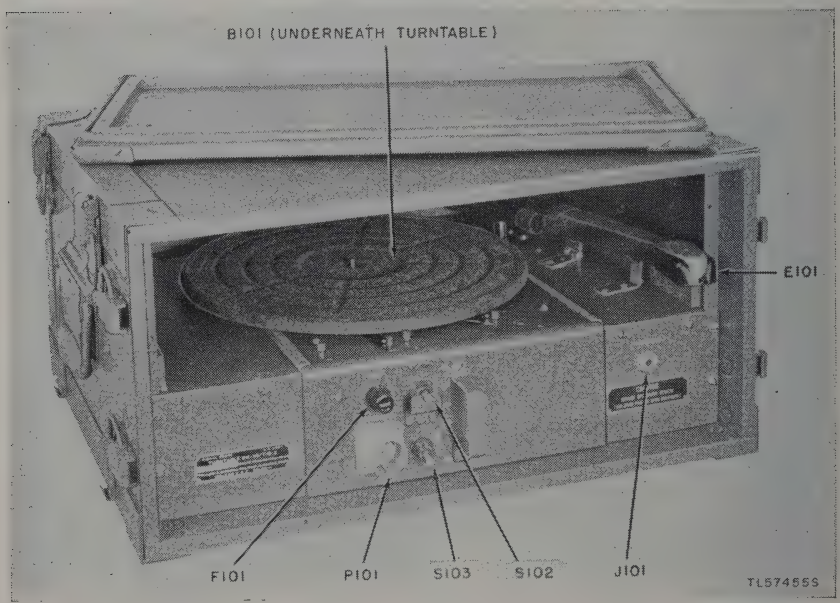

Figure 32. Turntable MX–39/TIQ–2, front view, parts identification.

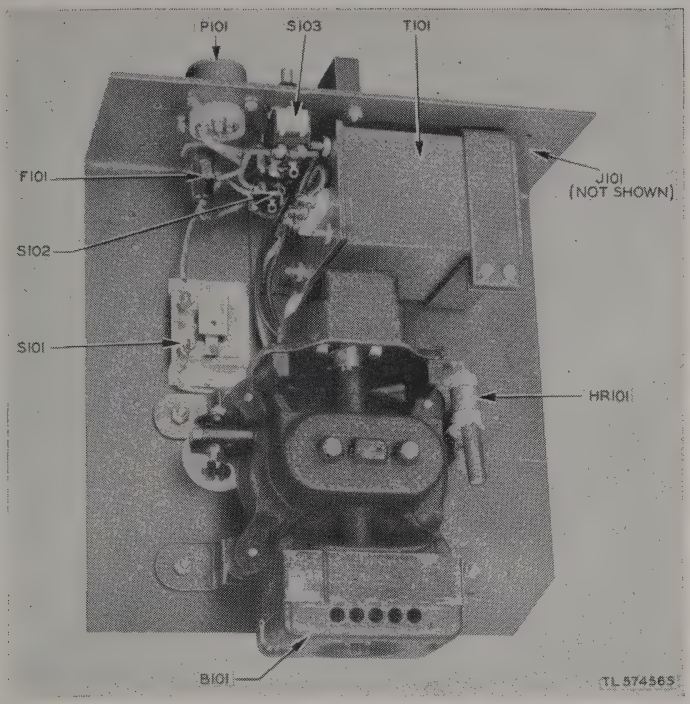

Figure 33. ***Turntable MX-39/TIQ-2, bottom view, parts identification.***